THE IRON TRADE REVIEW

VOLUME XXV. CLEVELAND, O. JULY 14, 1892. CHICAGO, ILL. NUMBER 28.

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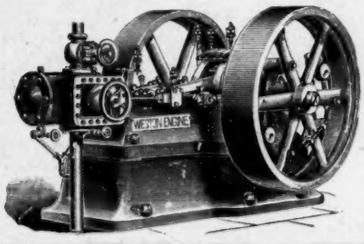

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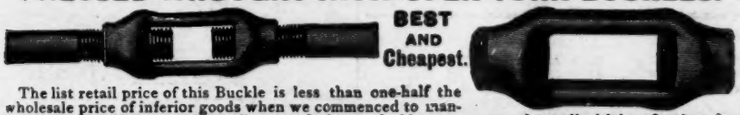

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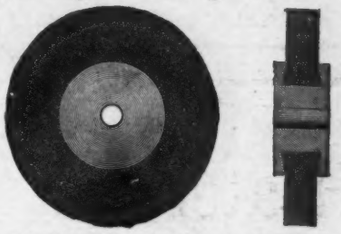

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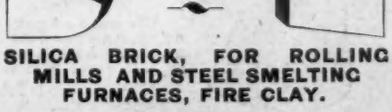

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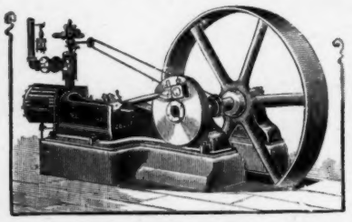

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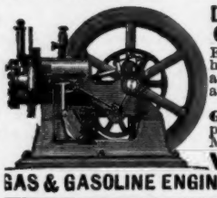

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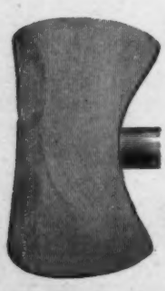

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THE IRON TRADE REVIEW

VOLUME XXV. CLEVELAND, O. JULY 14, 1892. CHICAGO, ILL. NUMBER 28.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

There has been no such paralysis of the iron market in the past week, as the Homestead situation and the fortnight's shut down of Western rolling mills would indicate. The non-union mills that are competitors of the Carnegie concerns are making the most of the present pressure of demand upon them, and the stock that rolling mills accumulated before July 1, is in fair demand. The present situation has only helped to call attention to the enormous consumptive capacity of the country, and to suggest that it will not require a long period of shortened production to relieve the market from the incubus of the Spring accumulations. There is about a month's supply of coke pig iron in the furnace yards to-day, and stocks were about 25,000 tons less on July 1, than on June 1. The Alabama and Pittsburg districts seem to be holding their own, while the Chicago district, through curtailments in anticipation of the smaller demand of the Illinois Steel Co.'s mills in July, has materially reduced stocks. The anticipated reduction from $16 to $15, for No. 1 X foundry iron, by the Thomas Co. has been openly proclaimed in the Lehigh Valley, and No. 2 X is to be $14. If necessary, we are told, these prices will yet be lowered, but it is well known that they are now substantially at the cost level. The cut means $12 at the furnace for the No. 1 X Virginia iron that has been disputing the Eastern market with the Lehigh product. There may be Virginia furnacemen willing to keep their furnaces in blast for such a market; but there are others who do not believe in smelting ores that can never be replaced, in using up their valuable coking coal, and wearing out plants that can not be renewed for less than the money that built them, in any such struggle for business as that which has brought the recent drop. A decrease in railroad building for '92, from last year's record, seems to be a certainty, but there has been a much more than compensating increase in other lines, particularly in the fast growing demand for structural material. The general trade and financial outlook is favorable, with prospects that the country's interior trade for the last half of the year will exceed that of the six months just ended. Business and financial movements up to June 30, were 9 per cent. in excess of those for the same period last year, a showing that hardly explains numerous expressions of disappointment the year has brought forth. If the troubles in the Pittsburg district should continue long, and extend in the way that now seems likely, the effect will be apparent in the dwindling of many activities. The Homestead shut-down alone means the cutting off of nearly 1,000 cars of ore a day from Cleveland, Ashtabula and Erie, and the railroads are feeling seriously the loss of the heavy tonnage of manufactured material. The Connellsville coke region, the only one that has shown any activity for several weeks past, is now feeling the effect of the halt in mill operations.

THE LOCAL OUTLOOK.

Vesselmen have made heroic efforts to get the Escanaba rate up to 75 cents in the past week, with improving chances of success, though there are as yet no charters at more than 70 cents. The Escanaba shipments have been prodigious this season, and though the railroads will not give out the season's figures, a total of 171,000 tons for the first week of July shows that the movement has been beyond any precedent. Vesselmen are aware that a goodly fraction of the season's shipments from all the upper docks have been made at a low figure for freights, and that their season's profits are yet to be made. An occasional stiffening of the wheat rate gives some encouragement, but the amount of grain to be moved immediately is not great, and ore men have not had to bid up to get boats as they were needed. The Marquette and Ashland rates are maintained at 95 cents and $1.10.

Iron Ore. There have been no sales of any moment in the week, and with the demand for pig iron cut off and the time of its resumption entirely problematic, ore salesmen are making no effort to interest furnace owners. On standard ores, particularly on the Bessemers sold in the Winter, there has been no deviation from prices at which sales were then made, since there is no object in the ore firms making the rebates on handsome advance sales, that chance transactions now, on a lower basis, would make necessary. While the cessations in steel works and mills are felt for the time, it is believed that the resumption, when it comes, will give a stimulus to buying that will make the season's aggregate much more than would have been the case, had there been no interruption, with purchases going on in the half-hearted way of the past four months. Reductions of force at the Champion mine and the prospect that the Lake Superior mine may take similar action, are only natural results of the furnace banking movement.

Pig Iron. While stocks of raw iron in the valley have increased since June 1 this has not been from increased production, but rather from slacking demand. Sales are still made at unquotably low figures and deliveries are being pushed into the coming year in response to buyers' demands.

Finished Iron, etc. The market for finished iron is without life, buyers having placed orders in June, in anticipation of the shut-down and deliveries on these are still going on. When all these have been made, mill stock will advance.

Structural Material. The Carnegie shut-down has advanced prices on such of their products as were made exclusively or largely at the Homestead mills. There is a large amount of bridge work in sight.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Chicago. A fair amount of tonnage has been closed during the past week, and a moderate number of inquiries have been received. It is expected that the next week will develop a little more business, but beyond that no hopes are entertained of the situation improving in the next 60 days. Prices remain stationary on the standard grades of iron, though a little cutting continues to be done in iron other than standard. The consumption of iron in all departments continues heavy and is in excess of that of a year ago. Interest continues to center in Lake Superior charcoals. The leading furnaces are maintaining their position and show no signs of weakness; one or two outside companies are offering to take business at cuts of 25 or 50 cents below basis held by standard companies.

BAR IRON.—Though a little spurt has been caused by the strike, the market remains comparatively quiet, with prices stationary on a basis of 1.5c at the mills. Some of the local dealers have taken advantage of the strike to raise prices slightly, but the mills are not affected by this.

BILLETS AND RODS.—Prices are a little higher on billets, being quoted at $24.75. Rods are selling at the same price as last quoted, $34.50. Dealers are only accepting orders for immediate delivery, and are not anxious to sell.

STRUCTURAL IRONS.—Many of the mills being shut down, and the supply limited, none of them are anxious for orders, and as a consequence prices are firmer and higher. Beams and channels, 2.25c to 2.50c; angle bars, 2.10c to 2.25c; sheared plates, 2.20c; universal plates, 2.20c; tees, 2.40c to 2.50c.

PLATES, TUBES, ETC.—The situation is the same on these as on other products. The strike and shut-downs have caused dealers to be careful about selling. The demand is good, and prices rule higher. Flange steel sheets are quoted 2.50c to 2.60c; tank steel, 2.05c to 2.10c. Nos. 10 to 14, 2.35c to 2.50c.

MERCHANT STEEL.—The market is firmer and shows a good demand. Quotations are made: Open-hearth spring, 2.50c; tire, 2.25c to 2.30c; machinery, 2.20c to 2.25c; crucible spring, 3.25c to 3.50c; machinery, 4.75c; tool steel, 6.50c to 7.50c and upward.

RAILS AND TRACK SUPPLIES.—Buying has been a little freer during the past week, inducing a firmer feeling in the market. Prices, however, remain as last quoted, $31 to $32.50, for steel rails; splice bars 1.95c to 2.05c; track bolts, hexagon nuts, 2.65c; square nuts, 2.60c.

OLD RAILS, SCRAP, ETC.—Nothing is doing in the market, and the prospect for business is very poor. Prices are stationary. Old rails, $17.50 to $18; old wheels, $14; old steel rails, $12 to $13; No. 1 forge, $14; No. 1 mill, $11; turnings, $8; mixed steel, $9; coil steel, $13.50; leaf steel, $14.50; low tires, $14.50.

Pittsburgh. There is as yet neither a settlement nor a strike to report in this district. The conference committees are still holding meetings and while but little progress towards an adjustment seems to have been made, yet the very fact that both parties are still willing to meet each other and discuss the points of difference, encourages the belief that an agreement will probably be reached. It is thought by many that the deplorable disorders at Homestead have helped to dispose both parties to this scale controversy to do all they could to avoid a strike. The demand for raw iron is, of course, much lessened, and the market is weak, though quotations do not change. The market for blooms and billets is likewise dull, owing to the shut-down of many consumers' mills. Considering the labor situation, the volume of business is quite heavy.

Detroit. There can be no doubt that the large season purchases of Lake Superior charcoal iron have been made, as a thorough canvass of all the large buyers shows them to be covered for all ordinary wants of this grade of metal for the current year. It will be interesting to see how far the large stocks in the hands of the makers have been depleted. There should be a decided improvement in the Lake Superior iron trade, a number of furnaces having stated their intention of blowing out as soon as their present supply of ore, charcoal, etc., is exhausted. It is safe to say that prices have not varied fifty cents a ton this season, and, to-day, a purchaser would obtain the same figures, or a trifle better even, than those named to the first buyers' when unsold stocks showed over 100,000 tons, the variation of even the fifty cents named, being due to conditions of delivery and terms of settlement. In foundry and forge irons a little more activity has been seen, one large buyer in the local market having placed orders for about 3,000 tons, during the past week. The smaller car-load and less than 100 ton business remains unchanged. The closing of the Carnegie mills has given local agents of other mills a number of orders to replace those unfilled at Homestead.

Louisville. A few fair-sized orders have been booked during the past week, but the volume of business is by no means large. What was sold was at prices never recorded here before. It would seem as though all the "false bottoms" are knocked out now. The labor troubles at the Homestead mills and the uncertainty of any early adjustment of the question has its weight upon the general iron interests. During the usual mid-Summer shut-down, whatever differences existed in regard to wages, in this immediate section, have been adjusted and the mills are all starting up.

Cincinnati. The iron market has been generally dull the past week. Nevertheless, quite large transactions have been closed; the largest of these have been in Bessemer pig, Lake Superior charcoal iron and Southern coke irons. It is a significant fact that the question of whether now is a good time to place iron contracts has been under discussion in the directory of a good many companies. There is nothing in immediate sight that would point to any increase in price. The arguments and conditions are all right, but it does not move. Indications are that the railroads will have another great crop to carry. This is sustaining the price of securities against the depressing effect of the withdrawal of American gold and other securities as the natural consequence of renewed silver agitation.

Buffalo. Some good-sized contracts ranging from 500 to 1,000 tons have been placed during the week, together with carload and 100-ton lots. The prices are low but the tonnage is quite large. Lake Superior charcoal still continues to attract more or less attention among buyers. It is difficult to say just what the market is on account of special prices made on the merits of each sale, and quotations continue as during the past few weeks, though in many cases the prices quoted might be shaded.

Foreign Market. Reports as to the British iron market, at the opening of the month, show no improvement. In the North of England pig iron market there has been more activity, though the run has been mostly on warrants, which has caused a substantial rise in prices, the warrants being required by speculators who have been delaying too long covering, and now are forced to buy at any price.

THE IRON TRADE REVIEW

DEVOTED TO
IRON ORE, IRON AND STEEL MANUFACTURE, MACHINERY, TRANSPORTATION, INDUSTRIAL PROGRESS, STATISTICAL INFORMATION, ETC.

PUBLISHED EVERY THURSDAY BY
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CLEVELAND, OHIO.

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JULY 14, 1892.

ORE TRADE TENDENCIES.

The evenness of ore rates this season and the large increase in the percentage of ore carried in vessels owned by mining companies, are notable facts in the iron ore trade of the year. The last two months have demonstrated that the tendency of the gradual extension of mining companies' transportation interests is to prevent fluctuations in rates and to give steadiness to the ore freight market, avoiding the extremes that a strong demand for grain tonnage has brought in other seasons. While the vessel-owning mining companies are interested in maintaining a fair freight rate—because they want their boats to make a good showing, and, further, because of the influence of freights upon the price of ore—they are at the same time interested in being able to secure tonnage at a fair rate for whatever ore they may not be able to carry in their own boats.

The following list gives the names of vessels in the ore trade that are owned by mining companies, with their carrying capacity, at 15 feet. The vessels added this season are indicated by an asterisk :

Minnesota Iron Co. – Manola, Mariska, Maruba, Matoa, Marina, Masaba, 2,300 tons each ; *Maritana, *Mariposa, 3,000 tons each.

Menominee Transit Co.—Saxon, Norman, Briton, Grecian, Roman, German, 2,900 tons each.

Cleveland-Cliffs Co.—Pontiac, 3,000 tons ; Frontenac, 2,700 tons ; *Pioneer, 1,800 tons ; *Cadillac, 2,300 tons.

Republic Iron Co.—Republic, 2,500 tons ; Specular, 1,900 tons ; Continental, 1,600 tons ; schooner Magnetic, 2,000 tons ; schooner Grace Holland, 1,200 tons.

Lake Superior Iron Co.—La Salle, 2,400 tons ; Joliet, 2,400 tons ; Wawatan, 2,300 tons ; Griffin, 2,300 tons ; *Andaste, 2,500 tons ; *Choctaw, 2,500 tons.

Cleveland Rolling Mill Co.—*Samuel Mitchell, 2,700 tons ; Wm. Chisholm, J. H. Devereux, J. H. Wade, from 2,000 to 2,300 tons.

The past twelve months have accentuated the necessity of putting iron ore upon the market at a price lower than has been thought of in mining operations heretofore. Combinations that shall reduce every element of cost to the minimum are more and more frequent in later stages of iron production, and in steel manufacture ; and the mining industry is finding out more and more, that operations on a large scale furnish the only solution of the problem presented by cheap Southern ores for foundry and mill irons and the imminent competition, to an extent heretofore unknown, of Cuban ores for Bessemer iron.

There is little question that another year will find the number of heretofore active mining properties of the Lake Superior region considerably reduced and that those that are operated will be in fewer hands. The control, by mining companies, of their own lake transportation, will be more and more complete, and the high freights known in other years will probably never be repeated.

UPPER LAKE FURNACES FOR LEAN ORES.

The building up of a coke pig iron industry in the Lake Superior region seems only a matter of a few years. That this will be at the expense of some other district now an active producer of coke iron, is plain, from the fact that there is already 25 per cent. more coke capacity active or in shape to be made active at any time, than consumption calls for. Mr. John Birkinbine observes on this question, which he has studied closely :

> The rapid development of the Western portion of our country, particularly that which is tributary to or can be easily reached from the Great Lakes, may divert from Chicago and vicinity part of the future iron production to points nearer the ore fields, and yet within convenient reach of cheap transportation for the fuel. Whether this fuel will be transported in its raw state and coked at the blast furnaces, or whether it will be conveyed as coke, is a problem in process of solution, but I confess to feeling a gratification that the enterprise which I had the privilege of suggesting five years ago—viz.; the erection of a blast furnace at Duluth, Minn., in which Minnesota ores are smelted by the use of coke made near at hand from Pennsylvania coal carried by vessel to the head of Lake Michigan—has been sufficiently successful to encourage other lake ports to seriously consider the advisability of carrying out a similar project.

Mesaba ores that are below 60 in iron, and carrying too great a percentage of phosphorus to warrant shipment, will no doubt be available at very low prices, for furnaces at Duluth. Mining towns that have reasonable freight rates to Escanaba could consume their lean ores by starting furnaces, and find access at low transportation cost, to the Chicago market. Then would come the tug of war, with the cheap Southern irons, that have been for months active demoralizing agents in that market.

THE HOMESTEAD SITUATION.

The matter uppermost in connection with the Homestead trouble, the past week, has been, not the points of difference as to wages, between the Carnegie Steel Co. and its employes, but whether that town should be singular among all the municipalities of the country in having the law of the land superseded by the rule of a self-constituted committee of citizens. We have been told, from day to day, since the single day of rioting and carnage, that all was quiet at Homestead and that peace prevailed, rendering unnecessary the sending of militia or of sheriff's deputies. It was the same sort of peace that any man may have with the law-breaker, who siezes his property. If the wronged man makes no outcry and no resistance, the proceeding is exceedingly peaceful! With the Homestead workmen in complete possession of the mills, and no opposition to their lawless conduct by sheriff or governor, the situation certainly presented an ideal picture of peace and harmony.

That the introduction of Pinkerton detectives by the company was a mistake, is admitted—how great a mistake, the awful record of Wednesday made plain. But after all

that is said about the odiousness of the Pinkerton name in labor troubles. There was no knowledge among the workmen when they fired upon the barges, that these men were not deputies of the sheriff. And had the sheriff himself, at the head of a posse, attempted to take possession of the works, blood would have been shed just the same.

This defiance of law by the locked-out workmen, has found defenders; worst of all it has been excused and practically defended on the floor of the highest law-making body in the land. For a United States Senator to stand in his place and talk about the "co-relative ownership" of employes in the plant in which they work is a species of communism that would knock out every prop that supports individual ownership and control of property. Politicians have had their day, in the general flood of comment, and partisan newspapers have let no day pass without attempting to obscure the real question of present moment at Homestead, with irrelevant and often demagogic descantings upon the country's industrial policy. As if, forsooth, there had never been, outside of a country that adopted a protective tariff to encourage industry, any such thing as strikes, lockouts, or fatal labor riots.

The Carnegie Steel Co. has given out, through its chairman, Mr. Frick, that it will not again have anything to do with the Amalgamated Association in any conference over the wages it shall establish. Members of that association have for more than two weeks had the company's works in their hands; they took an active part in the riot of last week, and the company does not wish to have further dealings with them. It is one of the most unfortunate features of the contest, that an organization, generally so wisely managed, and with so much in its record that is good, should have put itself in such an attitude toward the law. To say that Mr. Frick had in mind from the beginning, a war upon the association, that should wipe it out in Homestead, does not gainsay the fact that the Amalgamated leaders in Homestead have given him occasion for just the stand he wanted to take, granting that this statement concerning his intention be true.

Now that the militia have taken possession of Homestead and the Carnegie Steel Co. has again been permitted access to its works, the situation is just what it was on the day of the lock-out. There can be no permanent peace in Homestead, on any basis that is not agreed upon between the company and its old employes, hundreds of whom own their homes and had counted on a life residence in the town the great mills have made. The chances of such agreement, in view of the declarations of the company's officers, are very slight. If the employes in the other Carnegie mills should go out, as seemed probable on Wednesday, a contest will ensue that promises to be one of the bitterest and most determined the iron and steel trade, have ever seen. Every resource of the Amalgamated Association would be employed, because with it, such a struggle would be a matter of life and death.

A LINE of argument, that seems to have an attraction for one class of writers who discuss wage reductions in the iron trade, for the daily press, starts out with the statement that workmen's wages are cut to increase the profits of the "protected iron barons." The Amalgamated Associa ion's committees, in their recent conferences with the manufacturers, have repeated and reiterated the statement that the wage reductions made would all be given to the consumer, anyhow, and they didn't propose to be cut for his benefit. There is something about these statements that does not seem to reconcile.

QUITE different from the popular notion, is the statement in the paper of Mr. John Birkinbine, given elsewhere, that statistics show that labor per ton of pig iron made is highest in the Birmingham district and lowest in the Pittsburgh and Chicago districts. The leanness of the Birmingham ores requires the handling of a larger amount for the production of a ton of iron than in other districts whose ores are richer. That is a factor in the problem that does not ordinarily have attention.

SOME of our British cousins cannot see that they will be greatly helped by World's Fair exhibits, in their trade relations with this country, because the United States has tariffed so many of their products out of this market and is supplying herself at home. They should not forget, however, that this is essentially a world's Fair and that whatever people under the sun they want to reach, this is their opportunity. You will find them all there, gentlemen of Great Britain.

NO mills, no strikes. *Ergo*, protection, that has filled the country with iron and steel manufactories, is responsible for existing labor troubles. Such is the masterful logic that has fallen from the lips of certain United States Senators within the week just past.

Important Movements in the Valley.

The incorporation, on July 7, of the Ohio Steel Co., of Youngstown, O., with a capital of $750,000, is the final taking shape of the movement of Mahoning Valley iron factors toward the manufacture of their own steel. The incorporation includes within the scope of the new company, the operation of mines and coke works, which means that the promoters of the steel works enterprise intend eventually to make their own coke, as indicated in these columns recently. Pittsburg and Sharon iron men are with the Youngstown manufacturers in this movement and it is said that they have secured an option on 630 acres of coal land in Uniontown.

Another important move of Valley manufacturers is thus announced in a Youngstown dispatch: An industrial deal involving large interests was consummated on Saturday, July 9, Cartwright, McCurdy & Co., running extensive mills, and the Youngstown Iron & Steel Co. owning the Youngstown, Girard, and Warren rolling mills, consolidating under the name of the Union Iron & Steel Co. Upon the completion of the organization all the plants will be operated under one management.

Irondale Iron & Steel Co. Under New Auspices.

Messrs. John F. Whitelaw, President of the National City Bank, of Cleveland; George A. Laughlin, President of the Cleveland Axle Manufacturing Co., and H. O. Crane, of Chicago, have purchased the interest of G. R. Root and others in the Irondale Steel & Iron Co., of Anderson, Ind., and will operate the plant in the future. The capacity of the mill, which is at present 20 tons of steel and iron sheets, Nos. 14 to 33, per day, will shortly be enlarged by extensive additions to the plant to about 30 tons. From 150 to 200 men are employed in the mills. Having the advantage of natural gas, and with the energetic management promised under the new company, the outlook for the Irondale mills is bright. The officers of the company as elected at a meeting held in Cleveland, on Tuesday, July 12, are: Geo. A. Laughlin, Cleveland, President; John F. Whitelaw, Cleveland, Vice-President; H. O. Crane, Treasurer and General Manager. The office of Manager Crane will be at Anderson, Ind.

HOLLAND, which has always refused to participate in previous expositions, has been induced to make an exhibit at the World's Fair, and the King has appointed a commission, composed of the leading citizens and business men of the kingdom.

THE WEEK AT HOMESTEAD.

Military in Control and Congressmen Investigating.

The events of the week at Homestead have so filled the public eye, that no detailed account of them is called for here. Only the briefest synopsis is attempted :

The surrender of the Pinkerton 300 and their removal out of Homestead left the workmen's advisory committee and its pickets in control of Homestead and the mills. Persons entering the town were taken in hand, and required to give a satisfactory account of themselves. Newspaper men were subjected to not a little annoyance in pursuing their quest for information. Disorder ceased, it is true, but things were quiet because the workmen had their own way.

Meantime, Sheriff McCleary was continuing his farcical efforts at Pittsburgh to get together a posse. Hundreds of citizens were ordered to report for duty, but only a handful responded. The sheriff telegraphed almost daily to Governor Pattison that it was impossible for him to get any force together to restore the supremacy of the law at Homestead or restore to the Carnegie Steel Co. the possession of its property. The workmen sent a committee to Harrisburg, and in their interview with the Governor he is said to have given them to understand that no troops would be sent to Homestead unless there were disorder that needed to be suppressed. Suddenly, on Sunday night, the order flashed across the wires for the immediate movement of all the militia of the State to Homestead. The Governor had evidently changed his mind; of the reason for the change the public is not advised. There had been no change in the situation at Homestead, and the leaders there were taken completely by surprise. On Tuesday, under command of Gen. A. Louden Snowden, between 3,000 and 4,000 troops took possession of Homestead; an equal number rendezvoused at Mt. Gretna to be ready on call.

Statements and counter-statements as to the wage question, have filled the newspapers, throughout the week. Chairman Frick and Secretary Lovejoy have said with positiveness, that they will not treat with the Amalgamated Association, and that the men who have engaged in riot, who have unlawfully taken possession of their property and killed their guards, could not be received in their employ. It is known that this position is unalterable and will be maintained, though fire should never again be lighted in the Homestead mill. The officers of the company say, that there are many of their men who would return to work but for the leaders, and that now that the militia are on hand to preserve order the works will resume. Efforts are being made in other cities to engage new men. As to the introduction of Pinkerton men, the company say that it was their understanding with Sheriff McCleary that these men would be sworn in as his deputies, if necessary, and that to that end the sheriff's chief deputy, Gray, was sent with the Pinkertons, on the barges. It is admitted, however, that the men were not actually deputized.

In reply to Mr. Frick's public putting of the company's stand—in which he gave the points already made in these columns, as to increased tonnage, due to improved machinery, costing thousands of dollars, as to the reduction in the billet minimum demanded by the lower market price and as to the change of the end of the scale year to December 31—the men have made several statements. They say that the production has fallen below 1889; that in the 32-inch armor plate mill, at the basis of $23, sweepers and tonnage men would only make $1.86 for 12 hours' skilled labor, and all tonnagemen below them would make less. "Inasmuch as a laborer only works 10 hours and a tonnage man 12, it can be seen that the sweepers' wages and laborers' would be the same. Those people are the men who make the armor plate, which to-day at Homestead does not cost more than to make slabs, but for which the Government is charged from $150 to $600, according to sizes, while the actual cost of rolling it in the armor plate mill is less than 50 cents a ton."

The men deny that only 325 out of 3,800 employes are affected by the change proposed. They insist that all the men in the works are affected either by the tonnage change or the change in the billet minimum.

In his testimony before the Congressional committee, Wednesday, Mr. Frick said:

"I have a statement of the wages paid to men for month of May. This is in the 119-inch plate mill. The first man is a roller. He worked 24 days and received $259.05. The second is a roller who worked 22 days. His salary was $278.50, and so on, for this class. Shear helpers, average days worked, 22; average earnings $95 each for eight hours. Next come the heaters, six in all. The first worked 24 days, received $190.40; second, 23 days, $185.45; third, 22 days, $191.30; fourth, 23 days, $185.55; fifth, 21 days, $178.00; sixth, 23 days, $199.10. Helpers, five in all, average 23 days, average earnings about $135 per month; first cranemen, three in all, average 25 days worked, average earnings, $120; second cranemen, three in all, average 25 days worked, average earnings, $97 per month. Next pull ups. They are boys and work by day. There are four in the works; average days worked 22, average earnings $40 per month. They work 12 hours. Head shearers work 12 hours, five in all, first 17 days, $112; second, 24 days, $90; third, 23 days, $120.50, etc. Then comes the marking gang, first, 27 days, $85; second, 25 days, $85. Then come stampers, helpers, recorders, machinists, carpenter, greaser, hydraulic man, three table men, engineers, shapers, traveling cranesmen and boys; average days worked, 26 per month; average earning, $70 per month. Then ordinary laborers, 30 in all. Lowest priced labor is 14 cents per hour; usually work 10 hours. Others classed as laborers that are paid higher. I notice one here receives $1.70 per day. In the 119-inch plate mill for May, the total pay roll was $20,202."

The Iron Scale Situation.

Almost daily conferences have been held at Pittsburgh in the last week between the manufacturers' committee and the committee of the Amalgamated Association, on the iron scale. Some foot-notes to the scale have been agreed upon, but the main questions are still unsettled. The next meeting will be held Monday, July 18. The fact that both sides are willing still to confer is an indication favorable to ultimate agreement. Among late signers of the scale are the National Iron Steel Co., of Marion, Ind; Wetherald Rolling Mill Co., Findlay, O.; New Albany Rail Mill Co., New Albany, Ind.; Mixdorff Krein Manufacturing Co., St. Louis, Mo.; Moorehead-McLean Co., owners of the Soho mills. To date there have been 31 signatures, beside the 37 sheet mill firms.

The Mahoning and Shenango Valley manufacturers' committee has had no further meeting with the men's committee. The manufacturers gave notice before the Amalgamated Association's adjournment that they wanted no more conference unless it could be had with a committee having full power to make changes in the Amalgamated scale. To this, no response has been received.

In Illinois Steel Co. Mills.

The Illinois Steel Co.'s rail mills at South Chicago, employing 4,500 men, are running, the wage contract not expiring until next year. At the Joliet steel and rail mills, employing 2,000 men, notice has been given of the company's desire to make a change in the scale, but meantime the men are at work. The Joliet rod mills, employing 300 men, stopped July 1, the contract expiring. The scale is now being discussed. The Bay View mills at Milwaukee, are closed and the scale is under consideration. At the Union mills, Chicago, employing 1,800 men, the scale expires next year. At the North Chicago mills, employing 800 men, there is a shut-down. The yard is full of material and repairs must be made.

Improved Process for Castings.

The Waukegan Iron & Steel Castings Co., of 1319 Monadnock Building, Chicago, are making castings by a new process which insures absolute freedom from blow holes, and permits of so tempering the castings, that they fully take the place of drop forgings. This process, which has been in use in the East for a year, has recently been adopted by the Waukegan Co., and has been giving the best satisfaction. The company have already taken contracts to the full of their capacity, and in consequence of the rush of orders, have commenced to extend their plant very largely. The officers of the company are: C. R. Rothwill, President and Treasurer; Geo. C. Marsh, Secretary, and Ed. L. Lamb, Superintendent—all of whom are men of business ability and practical experience. The company will undoubtedly take rank among the first institutions of the kind in the country.

THE Krupp gun manufactory, of Germany, will exhibit a big gun, weighing 122 tons at the World's Fair.

PIG IRON PRODUCTION.

Locality and Other Factors in the Cost Problem.

President John Birkinbine brought out some interesting facts on crude iron production in the United States, in his address before the American Institute of Mining Engineers at the recent Plattsburgh, N. Y., meeting, on "Influence of Location on the Pig Iron Industry." He said that proximity to a market for finished product is a powerful factor in determining location. A local market is an incentive for trade, and transportation charges for 600 miles are not proportionately greater than for 200 miles. It is due to the latter that coke can be sent to Chicago, ores to Pittsburgh and Eastern Pennsylvania, and it gives a reason for the advancement of the Birmingham district of Alabama, for the product of the furnaces of Alabama has reached points so far removed that were it not for the excellent system under which large quantities of material are handled, it would be impracticable, even at very low rates of production, to supply iron to points now reached. Similarly, the low cost of mining, handling and transporting iron ores has permitted other districts to attain their present position.

The speaker then grouped the prominent pig iron producing States into four principal districts, namely, Pittsburgh district, Eastern Pennsylvania, Illinois and Alabama districts. The source from which the Pittsburgh district and the Chicago district draw their ore supplies—the Lake Superior region—has been contributing iron ores since 1856, and doing this on a liberal scale since 1867, a total of 5[illegible],000,000 gross tons having been taken from the mines of the four ranges included in that region. The number of important producers which continue to contribute iron ore liberally for a term of years, the knowledge of new discoveries each year adding to the ore reserves, and the millions of capital invested in the Lake Superior region in mines, railroads, and in shipping docks, supplemented by other millions in vessels and receiving docks, would indicate that the supply from this source does not promise an early exhaustion. The Connellsville and other Pennsylvania coal fields relied upon by the Pittsburgh and Chicago districts for coke also give little anxiety as to its future supply.

Neither does there seem any immediate prospect of either the coal or the ores in the vicinity of Birmingham becoming exhausted, but the large increase in the number of furnaces will rapidly deplete the easily-won leaner ores, of which greater quantities must be mined to produce a ton of pig iron than where as a rule the veins or beds are richer, as is the case in the Lake Superior region, and although the Alabama ore supply is great, the heavy drafts upon it may add so much to the cost of mining as to seriously detract from other local advantages. It is probably practicable to augment the local ore supply of the Alabama section in quantity and improve the average yield of the ore by using known deposits of iron ores in Cuba.

While the development of the country tributary to the four districts named, or within reach of them, will determine very largely the future growth, the important fact must be remembered that both the cost of production and the market facilities will influence iron manufacture. The actual cost of producing pig iron is not as far apart in the districts named as is often supposed. Under good management the maximum difference between the costs of similar grades of pig iron, as reported by members of the institute, is about $3 in the four districts, but the cheapening of transportation brings plants into close competition which are hundreds of miles apart.

Taking blast furnaces in the various districts of nearly similar dimensions which are well located, managed and equipped, the relative costs of the different items show that the expense for fuel per ton of pig iron made was lowest in Pittsburgh and highest in Chicago; whereas, the cost of iron ore per ton of pig iron made was lowest in Alabama and highest in Pittsburg. Labor per ton of product, however, is reported highest in the Birmingham district and lowest in the Pittsburgh and Chicago districts. This last item is affected by a number of influences, among which is the difficulty of comparing the labor accounts of different furnace plants, where, owing to methods of management, the labor accounts may or may not include the services of certain mechanics or officers, or the unloading of raw materials. The large amount of materials necessary for the production of a ton of pig iron in the Birmingham district as compared with the requirements of the Chicago or Pittsburgh districts augments the number of furnace employees, and the demand for labor at iron works in the former has naturally kept the per diem close to that paid elsewhere.

The production of Bessemer iron and the proximity of steel plants to the furnaces producing Bessemer formed another interesting head of Mr. Birkinbine's inquiry. By the table printed herewith he showed the increase or decrease in Bessemer output in the various districts, between 1887 and 1891. This table indicates that in the Pittsburg district, with its 49.8 per cent. increase in pig iron production and its 78.61 per cent. increase in Bessemer, local consumption, rather than supplies of raw material, caused the expansion.

The tendency is toward cheaper pig iron production. Advanced mining methods and equipment, stronger locomotives, cars carrying heavier loads, as well as larger vessels and more economical machinery to drive them, have done their part to bring the raw material to the furnaces and carry the product away from them.

At the plants themselves technical knowledge has joined hands with mechanical skill in the construction as well as in the operations of the furnaces.

A necessity of economical and successful steel manufacture, especially in the acid Bessemer process, appears to be the production of large quantities. This permits of utilizing labor-saving appliances, reducing fuel consumption to a minimum, and encourages the concentration of a number of blast furnaces aggregating large capacity in the vicinity of steel works, where the direct method of conveying the molten metal from the blast furnaces to the converter assists in adding to the economy of the plant. As a consequence an immense producing capacity has grown up about the steel plants of the country and these great industries have advantages in buying raw materials in quantities, in employing the highest skill and in making use of the most approved appliances.

Are not the same economies possible for plants producing pig iron for foundries or mills in great quantities? And will not the future construction be in the direction of securing large outputs from centers of manufacture where supplies of ore and fuel can be assembled, and from which the product can be marketed most advantageously? The knowledge and skill which make blast furnace operations successful command compensation which is not measured by the tonnage produced; the division of fixed charges by a larger output, the purchasing

TABLE

SHOWING THE PRODUCTION OF ALL KINDS OF PIG IRON AND OF BESSEMER PIG IRON, IN CERTAIN DISTRICTS AND IN THE UNITED STATES, 1887-1891, WITH PERCENTAGE OF INCREASE OR DECREASE IN 1891 OVER 1887—(NET TONS).

DISTRICTS.	1887.		1888.		1889.		1890.		1891.		Increase or Decrease in 1891 over 1887.			
	Bessemer Pig Iron.	Total Pig Iron.	Bessemer Pig Iron.	Total Pig Iron.	Bessemer Pig Iron.	Total Pig Iron.	Bessemer Pig Iron.	Total Pig Iron.	Bessemer Pig Iron.	Total Pig Iron.	Bessemer Pig Iron.	Percentage.	Total Pig.	Percentage.
Pittsburgh District	783,268	1,671,187	791,016	1,785,990	1,246,898	2,378,170	1,496,664	2,722,643	1,399,017	2,503,456	615,749	78.61	832,269	49.80
Eastern Pennsylvania	929,614	1,929,777	797,757	1,738,713	810,805	1,793,639	981 418	2,209,926	798,483	1,876,597	131 .131*	14 .11*	53,180*	2.76*
Illinois	549,111	565,453	551,076	579,307	544,965	601,035	704,327	785,239	605,600	749,506	56,489	10.29	184,053	32.55
Alabama	None.	202,762	None.	449,492	None.	791,425	•None.	914 940	700	891,154	700	....	598,392	204.40
Total for U. S.	3,220,517	7,187,206	2,954,402	7,268,507	3,529,584	8,516,079	4,583,424	10,307,028	3,888,853	9,273,455	668 336	20,75	2,086,249	29.03

*Decrease.

and handling of materials and supplies in quantity, and the disposition of the pig iron and cinder, all combine to give plants of increased capacity an advantage over smaller ventures.

"Recent Changes in the Pig Iron Industry."

An article under the above title in the June *Cassier's Magazine*, by Wm. Kent, M. E., is enough of a commentary on President Birkinbine's address to make some quotation from it particularly pertinent. Mr. Kent gives a number of tables, the first of which shows blast furnaces listed in 1878 and in 1892, as being either in blast or in condition to be blown in when the state of the market permits. This number was 698 in 1878; in 1892 it was 569. The number of furnace companies or owners was 488 in 1878; in 1892, 356. Annual capacity in 1878, 5,868,000 net tons; in 1892, 16,296,000 net tons. The average capacity per furnace was 8,407 net tons in 1878; in 1892, 28,640 net tons. The decrease in the number of furnaces was 18.5 per cent, in the four years; in the number of companies the decrease was 27 per cent.

The mortality of furnace companies has been still more remarkable than that of blast furnaces, for besides those that went out of existence on account of the abandonment of the blast furnaces, many others sold out to larger companies. No such thing as a trust has ever been formed by the blast furnaces, but consolidation of the business into the hands of large corporations has proceeded rapidly. In the Lehigh Valley one concern leased the furnaces of three other companies, and another leased five furnaces. In Chicago one steel company consolidated with two of its rivals, and now owns 17 furnaces with a producing capacity of 1,240,000 tons per year. In Alabama and Tennessee two large companies swallowed up several smaller rivals, and they have just amalgamated with each other making one concern with 17 furnaces, with an annual capacity of 633,000 tons. In the Hocking Valley, Ohio, in 1878 there were 13 blast furnaces with 12 owners, all of these furnaces having been built since 1874 to smelt native ores with the raw bituminous coal of the district. In 1892 there were 14 furnaces in the district owned by seven companies, but not one of these companies is on the list of 1878, all of the original owners having sold out or become merged into the new companies. Many of these furnaces are now using Lake Superior ores and Connellsville or Virginia coke, instead of the native raw materials.

In the anthracite region, comprising the territory east of the Susquehanna river, the changes have been the most severe. Nearly half of the charcoal furnaces in that region have permanently gone out of blast since 1878, and of the anthracite furnaces many have gone out permanently, others have been rebuilt, and many have changed owners.

From 1873 to 1876 the total production of iron decreasing, while the product per furnace slightly increased, there was a great decrease in the number of furnaces in blast, or from 410 to 236. The increased demand for iron after 1876 caused a steady increase in the number of furnaces in blast until 1882, when the great increase in capacity, per furnace, which began in 1879, became felt, and in 1882 and 1883 the number of furnaces in blast decreased rapidly in spite of the increased demand for iron. The depression in 1884 and 1885, and the reaction in 1886, both had their proper effect, the first decreasing and the second increasing the number of furnaces in blast; but from 1886 to the present time, in spite of an extraordinary increase in the demand for pig iron, so great has been the increase in the average capacity of the furnaces that the number of furnaces in blast has remained practically constant.

The 569 furnaces now on the active list have an average annual capacity of 28,640 tons each, and a total capacity, if they were all in blast, of 50 per cent. more than the present demand. As the new furnaces recently built for using Lake Superior ores have a capacity of not far from 100,000 tons each, and the new furnaces in the South have a capacity of nearly 50,000 tons each, it is evident that a much smaller number of furnaces than 569 will supply the demands for pig iron for many years to come, and it is to be expected that many of the smaller furnaces now on the active list will be abandoned within a few years. The decrease in the number of companies or owners, 27 per cent. in 14 years, is a remarkable fact in the economic history of the age. It is characteristic of the change from individual to corporate ownership which is going on in nearly all important industries. While the nominal ownership, however, is being concentrated into a few corporations, the actual ownership is probably, however, through the distribution of stock in these companies among the general public, in a greater number of hands than ever before.

Another Southern Iron Boom's Collapse.

Beginning with Chicago, C. A. Norton, recently appointed receiver of the Georgia-Alabama Investment Co., is making a tour of cities in which the majority of the 15,000 stockholders of this troubled company live. Mr. Norton met some 50 Chicago stockholders in that city last week, and after the story of the mismanagement of the company had been gone over, it was decided that reorganization and more money were necessary to clear up the clouds now hanging so low.

About a year ago, the enticing circulars of the Georgia-Alabama Investment Co. were let loose upon Northern cities. The company started out with very large promises to investors, and with a great flourish it was announced that Benjamin F. Butler, was president; Congressman L. H. Roots, a banker of Little Rock, Ark., vice-president, and ex-United States Treasurer, J. W. Hyatt, treasurer. The company announced that it had begun to develop its iron furnaces and glass works at Tallapoosa, Ga., on a large scale. It gave a score of names of prominent men—Senators and other officials and several bankers—who were interested in the enterprise. The company did have glass works and an iron furnace in operation for a time, but they were shut down last Winter, and the company has not invested or developed much since. Investors were guaranteed that even while the development of the property was going on, they would get semi-annual dividends of 2 per cent. Last October a scrip dividend was made, but April brought nothing.

Receiver Norton says that the property cost the stockholders $1,500,000, and the total debts against it, so far as he can find out, will not aggregate much more than $150,000. The old management, he says, spent $48,000 a year in salaries and incidental expenses, while in reality the work ought to have been done for $6,000 or $7,000. It had, for instance, an agent in Chicago at a salary of $3,600, and whose office rent and other expenses footed up a good deal more than half as much in addition. Like and still more extravagant agencies were kept up in the other cities. The iron furnace cost $190,000, and the glass works $63,000.

The proposition now is that the stockholders liquidate the indebtedness, form a new company, and capitalize it at $250,000. After paying off its debts of $150,000, there would be $100,000 with which to start up the furnace and glass works. This means that the stockholders of small means will probably lose all that they put in. Those who attended the Chicago meeting agreed that nothing but reorganization would save the company. From Chicago, Receiver Norton went to Syracuse to hold a similar meeting.

Prosecuting Chicago Smoke Makers.

Secretary Phelps, of Chicago's Society for the Prevention of Smoke, is bringing suits right and left this week against violators of the smoke ordinance, and 60 offenders are on his list to be brought into the courts. Since the opening of some of the tall blocks of Chicago, the smoke nuisance has been aggravated and the society finds that its campaign of suasion must be reinforced by more decided action. The officers of the smoke prevention society have spent a good deal of time laboring with the proprietors of smoky chimneys and have urged the use of various devices. In some instances an improvement has been effected. In the majority of cases, however, a deaf ear has been turned to all expostulations, and these are the cases in which suits will be entered.

When the society began operations the officials conferred with the railroad managers with a view to doing away with the smoky engines. Some changes were promised, but so far few have been effected. The society has given the companies until September 1 to reform. After that wholesale prosecution will be entered.

From Polk street to the river and from the lake to the river is indicated on the society's smoke map as the center of the evil. Four-fifths of the time within this district the smoke hovering about the tops of high buildings is so dense that one cannot see objects four blocks away.

ORE TRADE AND MINING NOTES.

Receipts of ore at Ashtabula docks in June, this year, were 420,014 tons, and if this rate is kept up the year's receipts will be the largest in the history of that port. In June, 1891, Ashtabula receipts were 171,115 tons.

The steamer Corona, which was the first to bring a load of ore to this port this season, has already made 14 round trips between Ashtabula and Escanaba and will get out to-day for the 15th trip. Capt. Hall, who commands the Corona, says that if he has no accidents or unforeseen delays he will be able to make 40 trips before the season closes. The best record heretofore made between the two ports in one season is 36 trips.—[Ashtabula Telegraph.

A Duluth dispatch says of the fire on Friday night, July 8, that destroyed the town of Biwabic, on the Mesaba, located at the iron mines of the Cincinnati, Biwabic, Canton and McKinley companies: "The large camps of the Hamilton Ore Co., which employ 200 men at the Biwabic, were destroyed, as well as the buildings of the Cincinnati Iron Co., three stores, ten saloons, and several other buildings and dwellings. The loss is fully $20,000 and the insurance small. The work of rebuilding has begun."

The big pump at the Chapin mine, Iron Mountain, will soon be in operation. The mine is making 2,000 gallons of water per minute and there is some chance that the water of the Ludington will yet be raised by the Chapin pump.

The reduction in wages on the Menominee range begins with the Dunn mine. Supt. Cole, of the Schlesinger mines, says that owing to the low prices in the ore market, it is necessary to curtail expenses, to keep the mines in operation. The scale at the Claire, which is the same as the cut scale at the Dunn, remains in operation. Other mines in the district, the Crystal Falls *Diamond Drill* says, will follow the example of the Schlesinger syndicate.

The ditch cut in the bank of Lake Angeline has now lowered the water four feet. The big pump, that is about in operation will throw 1,440,000 gallons of water an hour. The contract calls for "draining the lake." The deepest water is 46 feet. There are not less than 25,000,000 tons of ore under the water.

Ispheming *Iron Ore*, July 9, says: "Two of the largest iron mines in this county are seriously considering the question of closing down for the season. As yet they have sold no ore for this year's delivery and they have been borrowing money heavily in order to run. Much is tied up in the stockpiles. If these mines do close, and the chances are that they will, it will throw about 2,000 men out of employment. The companies are amongst the most progressive in the district, and it is with much reluctance that they are forced to talk of shutdown." A dispatch of Monday's date says that nearly all the surface men at the Champion were laid off Monday morning and that it is given out that the mine will close down August 1, if ore on hand is not sold by that time. It is reported that the Lake Superior Iron Co. contemplates closing down if stocks on hand are not soon sold.

"I have had nearly 200 assays made" John T. Jones is quoted as saying about the Biwabik, "but I have not tabulated them yet. I can say this, however. There is a body of ore averaging 60 feet thick which will average 66.50 in iron and below .020 phosphorus. The average of the entire ore body, so far as we have uncovered it, is about 64 iron and .040 phosphorus. This puts the entire Biwabik in the Bessemer limit. One remarkable fact in connection with the operations of the Biwabik, a fact common with many other of the Mesaba mines, is that in not one of the test pits or shafts as far as sunk, ranging from 60 to 215 feet deep, has a pound of powder been used. Pick and shovel have done the whole work."

Ashland ore shipments for last week were 73,114 tons; for the season, 737,535 tons. The Norrie leads in season shipments with a total of 145,007.

Florence, Wis., *Mining News* gives the season shipments from the Florence as 18,109 and from the Eagle 8,795. Balance on hand at the Florence, 113,285 tons; at the Eagle, 1,984 tons. The total output of the Florence and Eagle mines this year thus far is 138,863 tons.

Track-laying on the Duluth, Mesaba & Northern began July 7, and at the rate of 1½ miles a day, it is expected that the mines will be reached by August 15. By September 1, it is expected that the road will be handling ore at its Duluth docks. The blast furnace at West Duluth will take ore through the Winter.

Tower, Minn., *Iron Journal* gives season shipments from Two Harbors up to July 6: Minnesota, 138,672 tons; Chandler, 193,391 tons. The shipments up to July 1 aggregated 308,514 tons. In June there were 97 ore clearances, an excess of 30 over June, 1891. The shipments for the month were 172,777 tons; Minnesota grades, 65,965; Chandler, 106,812. In June, 1891, 60,351 tons of Minnesota and 63,298 tons of Chandler, a total of 123,639, were shipped.

The Lake Superior Mining Co.'s section 21 mine was closed for an indefinite period, Saturday, July 2. About 60 men are thrown out of employment.—[Iron Mountain Iron Range.

In the last week in June 171,000 tons of ore were shipped from Escanaba, or 6,000 tons more than any preceding week's outgo, and greater by one-third than any week's shipments from Ashland. The C. & N. W. is equipped, however, to carry 40,000 tons a day, or 240,000 tons a week.

Never in the history of the Crystal Falls iron district has the Mastodon portion of it been so inactive as at present. The properties in that locality are the Mastodon, South Mastodon, Delphic, Great Eastern, Alpha and Atlas; the only one now in operation is the Mastodon, and that is going with but a day force, raising but little ore and shipping none.—[Diamond Drill.

At the Chapin mine, daily product now runs from 2,500 to 3,000 tons and daily shipments to 5,000 tons.

Great Car Works Consolidation.

A consolidation that means that the purchases of sundry large customers of the charcoal iron producers of the country will hereafter be massed in one great purchase, at prices that will go closer to cost than ever, is announced in this dispatch from Detroit: An important consolidation of car manufacturing companies has just been effected under the corporate name of the Michigan-Peninsular Car Co. It masses a capital of $8,000,000, exclusive of $2,000,000 first mortgage bonds. The companies entering the consolidation are the Michigan Car Co., the Peninsular Car Co., the Detroit Car Wheel Co., the Michigan Forge & Iron Co., and the Detroit Pipe & Foundry Co. The business dates from 1864 for the Michigan Car Co., and from 1879 for the Peninsular Car Co. These two companies are said to be the largest manufacturers of freight cars in the world, and heretofore have been in active competition. The consolidation brings into life a freight car manufacturing combine on a par with the Pullman Palace Car Co. in the way of passenger car manufacture. The united concerns have been furnishing equipment to the Lake Shore, the Illinois Central, the Union Pacific, the New York Central, the Erie, the Atchison, and in fact all the principal lines of the country. An idea of the magnitude of the operations may be gathered by the fact that the several companies have been employing over 5,000 men. The property owned covers about 81 acres of ground in Detroit with buildings 78 in number. The working plant, real estate, etc., are valued at nearly $6,000,000. The capacity of the combined companies approaches 100 cars a day. The net profits have been averaging, it is said, nearly $1,000,000 a year. The object of the combine is to reduce expenses and competition.

Ohio Institute of Mining Engineers.

The Summer meeting of the Ohio Institute of Mining Engineers will consist of an excursion to the coking regions of Pennsylvania. Arrangements have been made for a train over the B. & O. Railroad, leaving Columbus, Tuesday morning, August 2, and making its first stop at the mammoth works of the American Encaustic Tiling Co., at Zanesville. Going thence to Connellsville, Pa., the party will run out on Wednesday morning's train to the Standard, Morrell and Hill Farm mines and coking plants. On Thursday, Leisenring Nos. 1 and 3, the Juniata and the Trotter plants, near Uniontown, will be visited, and on Friday, Oliver No. 1, Leith, Redston and Lemont Nos. 1 and 2. Ex-Mine Inspectors King and Keighley will conduct the party. All who intend going should notify R. M. Haseltine, Secretary and Treasurer, Columbus, O., before July 27.

IMPROVED DAKE ROTARY ENGINE.

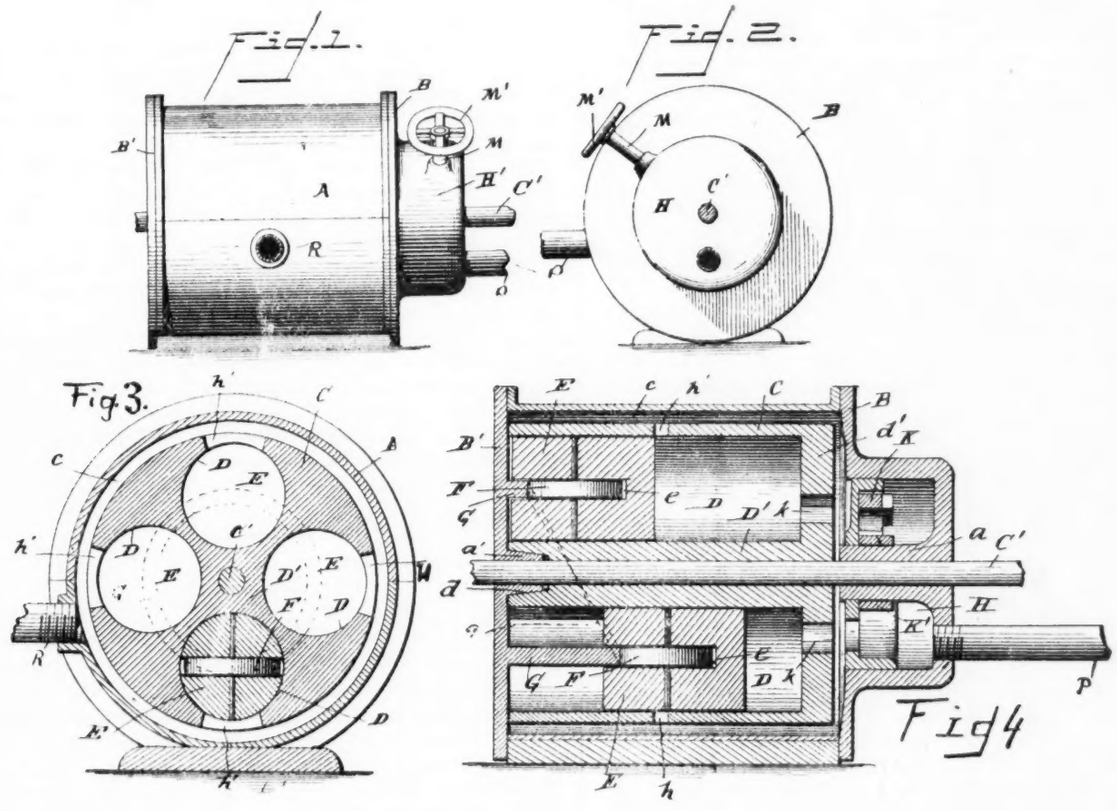
Charles W. Dake, of Grand Haven, Mich., and Edward B. Dake, of Muskegon, Mich., are patentees of improvements in reciprocating rotary engines, which will be understood by referring to the cuts given on this page. The inventions include novelties both in construction and combination of parts, and relate to rotary engines in which reciprocating pistons are employed to impart a rotary motion to a piston-cylinder. Of the accompanying drawings, Fig. 1 is a side elevation. Fig. 2 is a front end view. Fig. 3 is a transverse vertical section. Fig. 4 is a central vertical longitudinal section. A designates the outer cylindrical casing, having secured thereto the heads B and B′. Working in this casing and rigidly secured on a shaft C′, extended through the heads B, B′ and having bearings *a a′* therein, is a rotary cylinder piston-wheel C, the diameter of which is sufficiently less than the interior diameter of the outer casing to leave a surrounding chamber *c*. Extending into this piston-cylinder from one end are a series (four being shown) of cylindric chambers D, which terminate a short distance from the opposite end *d* of said piston-cylinder. In each of these chambers is a cylindric piston E, of a length about one-half the depth of said chambers and adapted to reciprocate therein.

The operation of the engine is thus explained: The normal position of the valve I and its cut-off K is such that its port *l* is a little to one side of the highest point of the cam G. Steam being admitted through the supply-pipe P, it will pass through one of the ports *k*, against the corresponding piston E, forcing it longitudinally and causing its anti-friction wheel to travel down the incline of the cam. As the engagement of the arcuate slot *f* with the edge of said cam prevents said piston from turning in its cylinder-chamber, a rotary motion will be imparted to the cylinder C. In the meantime the port *k* of the next piston-chamber has been brought into position to receive steam and a corresponding movement is imparted to its respective piston. As the cylinder C continues to turn, each port *k* will in succession be brought into position to receive a port of steam and its respective piston forced to travel on the cam which remains in a stationary position.

This operation is repeated, each piston successively receiving its head of steam when at about the highest point of the cam and exhausting through ports *h′* into the chamber *c* when at the lowest point, and thence through the main exhaust-pipe R, communicating with said chamber. The distance between any two ports *k* is less than the length of the port *l*, so that a dead-centre is impossible and the engine will start with the cylinder C in any position. On the under side of the valve I is an exhaust S for any steam remaining in the piston-chambers as the pistons are forced up the opposite incline by the operation of the succeeding piston.

When it is desired to reverse the engine, the pinion-shaft M is turned, and by means of the rack and pinion and the connection between the valves I and K the valve I is turned, so that its port will occupy a position slightly to the opposite side of the highest point of the stationary cam G from that which it normally occupies, so that as steam is admitted to said port the pistons will be forced to travel down the opposite incline, turning the cylinder C in the opposite direction. The valve I is capable of a movement through an arc of about one-half of a circle, being limited in both directions by the shoulder *j*, which engages the pinion-shaft at both limits of movement and serving as stops.

It will be understood that any suitable number of the reciprocating pistons may be employed, the operation being the same. By means of the valve K the size of the steam-port *l* may also be regulated and the speed of the engine governed.



IMPROVED DAKE ROTARY ENGINE.

Canton Steel Roofing Co. Wins.

In the suit in the United States District Court for the Northern District of Ohio, brought by the Canton Steel Roofing Co. against Alvin C. and William Kanneberg, as the Kanneberg Roofing Co., for infringement of patent on sheet metal roofing, the court has decided that the roofing manufactured by the Kanneberg Roofing Co., is an infringement upon the H. W. Smith patents owned by the Canton Steel Roofing Co., of Canton, O., and the Kanneberg Roofing Co. are perpetually enjoined from the manufacture of said roofing. The decision was rendered by Judge Ricks, on June 30.

W. S. Caine, president of the British Iron Trade Association, has issued an address to members of the trade in which he urges the importance of an exhibit at the World's Fair by British iron manufacturers.

GIST OF TRADE PAPERS.

A PAIR OF TARIFF POINTS.

Anthracite Is Duty Free—Whence, Then, the Trust?

The most conspicuous and financially the most powerful combination of capital, or trust, in this country to-day is that which controls the production and prices of anthracite coal, one of the leading necessaries of our American every-day life. And yet anthracite coal has been on the free list of all our tariff legislation since 1870. There is absolute Free Trade in this great mineral trust-controlled product. Upon the other hand bituminous coal is subject to a duty of 75 cents a ton; yet we hear of no trust anywhere, large or small, in its production or sale. Free Traders who assert that Protection fosters trusts and that Free Trade is their natural enemy will be in no hurry to tell a waiting world why the above facts do not accord with their theories.—[Bulletin.

The Tariff and Foreign Exhibits at Chicago.

There are touches of irony in an editorial in the London *Iron and Steel Trades Journal* on the advisability of English manufacturers of iron and steel going extensively into exhibits at the World's Fair. It says that the affair will mainly be a display of American greatness and American resources and that it is inappropriate, especially in the case of subjects of Victoria, that foreigners be invited to exhibit at all. "The American manufacturers are trying to monopolize the whole of the domestic trade of the country, and, thanks to the tremendous prohibitive tariffs, they succeed to a great extent, and yet they now invite us to spend time and money in showing what we make and how we make it. They will not deal at our shop, but they invite us to instruct and amuse them, exhibiting what we could sell if they would buy from us." After intimating that matters would be much simplified if Mr. Carnegie, who had said that there were things England could make more cheaply than America, would classify these things, the *Journal* remarks:

"There are many things of foreign manufacture, as we know, that Americans will have, and no amount of duty can keep them out of the market. It is pleasing to note that some of these things pertain to the iron and steel trades, as, for instance, Lowmoor iron plates, which are again being ordered for locomotive fire boxes. Our manufacturers might give an interesting object lesson, by affixing actual selling prices (*minus* duty) on all their exhibits, and the visitors to the Exhibition would not fail to compare the quality and price of home and foreign articles. * * * * We think it would have been better to entirely exclude the foreign element, and let all the glory belong to the great people who have arranged the affair. If it should happen that the exhibitors in any foreign section succeed in opening up a trade of any importance, the great powers at Washington would be invoked to alter the tariff, and so put a stop to the business. * * * * Everyone who can go, ought to go and look on and wonder at the marvellous progress of a great people, but iron and steel manufacturers as a rule will do well to leave their samples behind them, and on this occasion to decline the opportunity of exhibiting what they do at their works."

THE BRITISH IRON TRADE.

One Example of the Gloomy Outlook.

The gradual decline of the British iron trade is brought out by the official statistics of the production of iron and steel, and interesting side lights on the situation are offered by the history of individual companies. We referred a few weeks ago to the voluntary winding up of the West Cumberland Iron & Steel Co. after a prolonged struggle against bad trade. This week we hear that the proprietors of the Glengarnock Iron & Steel Works in Scotland, the manufacturers of the Glengarnock brand of pig iron, are attempting privately to float their works into a limited company. In their prospectus they say that though the value of their property is assessed at £629,927 they are willing to take a breaking-up price of £363,656, half in cash and half in shares. They estimate their profits in the future to be £58,500 a year, but they refrain from making any statements of past profits. They say, however, that they have shared with other works in the general depression of trade, and this, we presume, is equivalent to confessing the absence of profits or even the presence of a loss. This attempted transaction is not a particularly attractive one, to say the least, but we mention it because the desire of the owners to scramble out of their responsibility and secure some cash for their property before things grow worse affords us some insight into the state of the iron trade in Great Britain and its probable future, which seems black enough.—[Engineering and Mining Journal.

British and American Iron Consumption Compared.

The *American Manufacturer*, in discussing the relation between iron production and consumption in Great Britain and the United States, gives this table and the comment appended:

Great Britain.	Production. Tons.	Exports. Tons.	Home consumption. Tons.	Percentage of Home consumption to Production.
1890	8,229,214 (1)	4,479,854	3,749,360	46
1891	7,553,496 (1)	3,641,035	3,912,461	51
United States.				
1890	9,702,703 (2)	100,000	9,602,703	104
1891	8,779,870 (2)	100,000	8,679,870	105

(2) Including 500,000 tons estimated as imported.
(1) Including 325,000 tons imported.

The United States producing 20 per cent. more pig iron than Great Britain, consumes it all, and 400,000 tons a year more, while Great Britain consumes at home only about one-half of its make. Even on the basis of population, our consumption is greater. With double the population we consume over 2½ times more.

The facts regarding our production and consumption of iron and steel will show:

1st. That we produce more iron and steel than any other nation.

2nd. That our consumption of iron and steel, that is, our our consumption at home, is very much greater than that of any other nation.

3rd. That in tonnage we probably, including ingots, import more iron and steel than any other nation, though our imports of certain forms may be exceeded by other countries.

This all means that the United States is the best market in the world for iron and steel. Who shall supply this market? Our own mines, furnaces, mills and workmen as they do now to so large an extent, or the mines, furnaces, mills and workmen of other countries?

TRANSPORTATION QUESTIONS.

Foreign Trade from South Atlantic Ports.

There has been of late vigorous agitation of the possibility of opening through trade from South Atlantic ports to Europe, and sufficient progress has been made towards the formulation of definite plans to warrant the belief that something substantial and beneficial will result from the discussion of this matter in business circles in the South and by Southern newspapers. There is at present considerable direct foreign trade from Gulf ports, notably New Orleans, Galveston and Mobile, but the present movement more directly concerns the ports on the South Atlantic coast—Atlanta, Savannah, Charleston, Brunswick and others. While it may be something of a paradoxical statement, it may be said that the absence of direct foreign steamship lines from these ports is due simply to the fact that they have never been started, or, to put the matter a little differently, there exists every condition and requisite for their support, and they need only to be established in order to meet with success and be assured permanency.—[Manufacturers' Record.

Railroad Building Not a Great Factor.

It is apparent that it will not do to base one's hopes of better times on the money to be spent in building new railroads; but the influence of this element on the sum of the business and industrial situation is considerably overrated. The difference between 13,000 miles and 3,000 miles of new railroad built in a year (that is, between 1887 and 1892) is, no doubt, enough in itself to affect general business. It is a difference of, say, 1,000,000 tons of rails—more than half of our total product in 1890 and two-thirds of that of 1891. It is a difference of, say, 150,000 tons of iron for joints, bolts and spikes. But all of the rails made in the United States only consume about one-fifth of the pig iron made, and less than half the steel ingots produced, and the figures given above are

based upon a comparison with a phenomenal year, 1887, when about 13,000 miles were built. In only one other year in our railroad history dld the new construction reach 10,000 miles. If, then, we compare the first half of 1892 with the first half of 1891, when we find the falling off in railroad building to have been 500 miles [1,198 miles this year, so far] we shall see that it affects but an insignificant percentage of our total iron and steel production. Similarly, it might be shown that the effect of the decline upon the locomotive and car shops, and upon the general railroad supply business is, after all, relatively very small. The fact is, the business of building railroads has ceased to be a great factor in any one year's prosperity. To a few people it is of immense importance, but to the nation it is a small affair, and we must look elsewhere for the causes of any business depression. The falling off in new construction is only a symptom and not a cause.—[Railroad Gazette.

ASPECTS OF TRADE.

Combination the Solvent of the Iron Situation.

Noting the report at the recent meeting of the directors of the Tennessee Coal, Iron & Railway Co., of the acquisition of the Cahaba Coal Mining Co.'s interests—including 45,000 acres of coal lands, with seven mines and a yearly output of 800,000 tons, 16 miles of railroad, all necessary buildings, miners' houses and other property—the Chattanooga *Tradesman* says: "This addition, together with the recent purchase of the Debardeleben interests, makes the Tennessee Coal, Iron & Railroad Co. the practical owners of the entire Cahaba coal-field in Alabama. The *Tradesman* has never believed the problem of complete success in the iron trade of the South would be otherwise solved except through combined interests. In our opinion that is the only way in which the economics of operation can be brought into their fullest force; and the operations of the T. C., I. & Ry. Co. in 1891-92 seem to prove our position beyond chance of successful dispute. The company, by the simple force of the experience, capital and volume of business and means of business if controlled, made more money in a year when iron averaged 14 per cent. below the preceeding year, than it made in the latter. It is only the strong who can get the most out of anything, industrial, social or any other line of life. Nor can these strong concerns hurt the cause or reduce the wage of labor; rather do they improve labor's condition in all respects. These strong concerns—there must always be enough of them to compete with each other—through their superior economic management are naturally enabled to pay the best wages, and pay them most promptly."

Further Inroads of Steel upon Iron.

The *Iron Age* comments in its leading editorial this week, on some of the contracts recently closed by Western agricultural implement makers for iron and steel to be delivered in the next 12 months. While prices were kept up, early in the season of contract-making, competition finally became too keen among the rolling mill companies, especially those making cheap Bessemer steel stock. Bar iron makers were wholly unable to compete, and Pittsburg and Ohio manufacturers were completely barred out by rolling mills further West. It was a case of steel against iron and of the West against the East. The consequences are that Pittsburg and the Valleys must go lower than ever, and that steel will still further take the place of iron. The results are thus summarized: 1. The Western mills are now disposed to make a wholly independent set of prices, without reference to the advantage they have in freights as a protection against mills further East. 2. A more serious blow has been given to iron in merchant shapes than at any previous time. 3. It is difficult to see how the rolling mills can now agree to pay the past year's wages scale when they have sold a large part of their output for the coming year at such an extremely low rate. The agricultural implement manufacturers again enjoy a peculiar conjunction of favorable circumstances—cheaper material than ever and a continued heavy demand for their products."

A Bad Time for Cast Pipe Men.

The demoralization of the cast iron pipe trade leads the *Age of Steel* to speak of the development of that industry and the causes that have brought on the present trouble: "From 1881 to 1887 it had its big barbecue in prices and sales, in the aftermath of which has come the nullifying condition of too much pipe and too small a profit. This is apparently paradoxical in the face of increasing demands of pipe in railroad service and city sewerage and for drainage and culvert purposes, with the fact that the aggregate of mileage for water and gas works alone is sufficient to double its circle around the globe. This boom in demand had the usual response in the crowding of production. Older plants increased their output, while new and pushing competitors in the South and West added to the list of foundries, disgorging a meal for two on the plate where but one eater wanted a meal. This abnormal stimulation could have but one issue, of which the avenues of escape can only alternate in restricted production or a radical reduction in the cost of product. In the acute stage of cheapened cost, the penalty must be distributed between the manufacturer and the worker, with the disadvantages probably heavier at the working end."

LATE PUBLICATIONS.

August *Century* will contain an illustrated article on "An Ascent of Fuji the Peerless," Japan's sacred mountain, called variously Fuji-no-yama, Fuji-san, Fujiyama, Fusiyama, and Fuji plain and simple.

The E. W. Bliss Co., Limited, have recently brought out a new 400-page catalogue, bound in cloth, and, with the help of numerous illustrations and comprehensive descriptive matter, giving an excellent idea of their lines of presses, drop hammers, shears, dies and special machinery. The absorption of the Stiles & Parker Press Co. add a large number of machines to the old Bliss catalogue.

Jonathan Creager's Sons, of Cincinnati, manufacturers of brick-making machinery, have issued a Spanish catalogue that is only one of the multiplying evidences that reciprocity is a tangible thing and has introduced new elements into the manufacturing operations of the United States. Spanish catalogues and special traveling representatives who go directly to the Latin-American dealers whose trade is desired, are examples of the right way of going after this business. The catalogue before us contains most of the illustrations used in the firm's English catalogues and is quite full and complete.

A pamphlet entitled "Home Warming and Ventilation," containing the views of a number of good authorities on the best methods of house-heating, comes to us from the Herendeen Manufacturing Co., of Geneva, N. Y. The company, who publish the pamphlet, say in their preface: "If the reading of these articles suggests the using of our boiler well and good; if it suggests any other boiler or any other apparatus of heating, made by anyone else, the benefit recurs to others at our expense and the reader's gain." Accompanying the pamphlet is a catalogue of 165 pages on the steam and hot-water boilers of the Herendeen Co.

Chicago's Population.

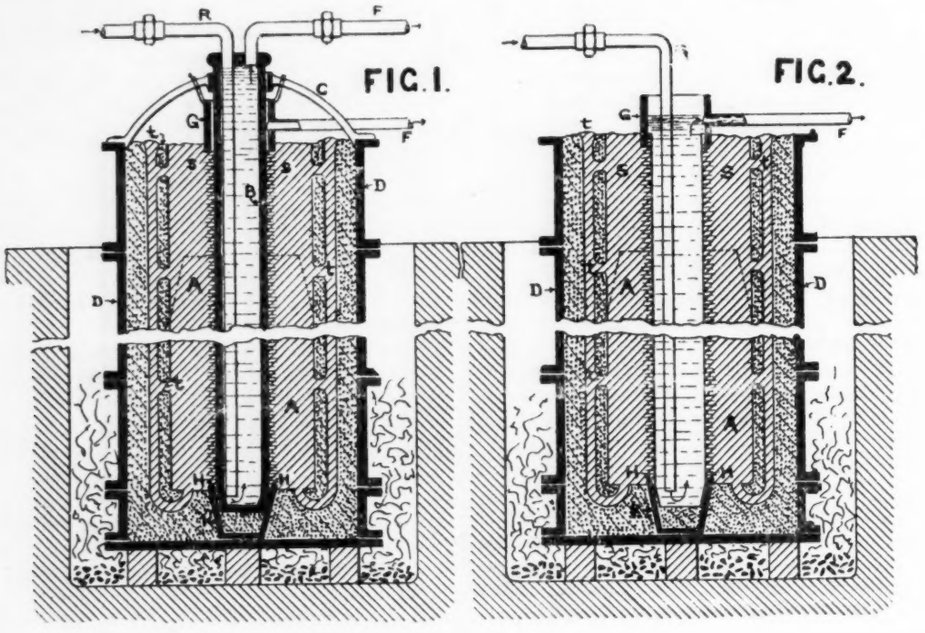
The new city directory of Chicago, which is nearly ready for delivery, shows Chicago to have gained largely over last year, the figures as given indicating the present population to be 1,420,000. This estimate is claimed by the directory people to be very conservative; and Manager Donnelly, of the directory company, says the city need have no hesitation in claiming a population of a million and a half. There has been an unprecedented amount of moving in Chicago during the last year, the many new office buildings—the "sky-scrapers"—being largely responsible for that; having drawn tenants from the older buildings that do not have so many modern improvements.

THE production of pig iron in Russia, excepting Finland, was, in 1891, 936,000 tons and in 1890, 873,000 tons. The increase since 1887, when it was 601,000 tons, has been very noticeable. The increase has been largely in the South. In 1886 the production of the Southern and Southwestern districts was but one-sixth that of the Ural district, while in the last year it amounted to one-half, although this latter has itself increased 42 per cent. in the last five years. In 1880 the production of steel was 301,500 tons; in 1885 it had fallen to 189,200 tons, and in 1890 it had increased to 364,800 tons. Since 1890 there has been a more marked increase, especially in the Southern districts, where the Bessemer process seems to predominate.

APPARATUS FOR CASTING CANNON.

An improved apparatus for casting cannon, the object of which is to relieve the opposing initial stresses, to prevent opposing lines of crystallization, to furnish an accurate and easy method of centering the core, and to lessen the waste of metal and the cost of casting, is in use at the Builders Iron Foundry, at Providence, R. I. It was invented by Mr. Richard A. Robertson, Jr., the treasurer of this well-known Providence establishment.

This invention relates to that class of castings in which a hollow core is used in connection with a mold, the cooling of the casting being accomplished from the interior, while the radiation of heat from the exterior is retarded. In the accompanying drawings, Fig. 1 is a vertical section through the center of the molding-pit, flask, mold, casting and core. Fig. 2 is a vertical section through the same after the core has been withdrawn, showing a cooling-pipe inserted in the bore.



APPARATUS FOR CASTING CANNON.

In the old, or Rodman process, of casting cannon, in which the method of cooling the casting from the interior was the basis, the core was suspended in the mold cavity, and a considerable distance was left between the lower end and the bottom of the mold. This case was held by a frame called a "spider," placed on the top of the molding pit. To centre the core in the mold cavity the "spider" was adjusted by screws. The core being of great length, a slight change of its position at the top made a much greater variation at its lower end, and rendered the centering of the core, in relation to the mold cavity, a work of difficulty. Its lower end being free, any irregularity in the flow of metal deflected the core from its position, and consequently, when the core was withdrawn the bore of the casting would be eccentric and the casting would be worthless for a cannon—a not infrequent occurrence. The buoyancy of a core of considerable length when held in suspension in a mass of liquid metal created a powerful upward pressure, and to prevent the displacement of the core, the spider and the adjusting screws had to be made of unusual strength. In the cooling of cannon cast in this way, the tendency of the lines of crystallization being to lie normal to the surfaces of the crystallizing mass, those lines extending from the sides of the casting diverged from those at the bottom of the casting at almost right angles. The result was that lines of weakness and irregular initial stresses were developed at the base of the casting. As a result it was necessary to cut off a large part of the casting so weakened at its base, while the effect of the different stresses near the escape pipe was not only to crack the metal in the sinking head, but frequently so far longitudinally as to ruin the whole gun.

In Mr. Robertson's apparatus, the remedy for these defects is the mechanism for cooling the casting uniformly at all times, throughout its entire length, from the bore outward, so that the lines of crystallization shall radiate from the bore normally to its contour at every point throughout its entire length. In the process of casting, the liquid metal is introduced into the mold-cavity as usual, through the gates or runners *l l* and attaches itself to or fuses itself with the projecting rim H of the pot K and also with the lower edge of the cylinder G, thus making them a part of the casting, Fig. 2. The inventor prefers this method of connecting the cylinder with the casting; but it may be made a part of the casting or otherwise joined—*e. g.*, the cylinder may be lowered into contact with the casting—and after a reasonable time the connection can be "luted" at the surface of the casting. The next step is to force water through the pipe R in the core B, which core was made hollow to carry said pipe and as a return-conduit for the cooling fluid, Fig. 1. After the core has been withdrawn from the casting, the cooling fluid is forced into the bore of the casting itself through a pipe R′ in the manner already described hereinabove. (See Fig. 2.) The hollow formed by the print in the pot after the core is withdrawn (or the hollow part itself, if no print is used) allows the water or other cooling fluid to flow beyond the lower end of the body of the casting, and the cylinder at the top of the casting (also a part thereof, as shown) permits the fluid to rise above the sinking head S and casting proper to the escape pipe F, Fig. 2. Since the cylinder and pot touch or nearly touch the outer surface of the core, it is evident that when they have been made a part of the casting the cooling fluid cannot touch any part of the casting proper except the bore, unless it be a very small part of the extreme outer ends of the casting at its top and bottom near the cylinder and receiver. Hence it follows, the fluid having been carried entirely through the bore of the casting and beyond the casting proper at both ends thereof, that the process of cooling will be uniform, that there is no intersection of different lines of crystallization, that the intensity of the initial stresses is made uniform, the formation of lines of weakness prevented, and consequently that there is no danger of losing a casting from these causes.

To Washington, D. C., via Pennsylvania Lines at Reduced Rates.

On July 16th and 17th excursion tickets to Washington, D. C., account meeting of League of American Wheelmen, will be sold from principal ticket stations on the Pennsylvania Lines at greatly reduced round trip rates, good to return until July 24th.

WEALTHY Cincinnati people got $3,750 verdict against North Bend, O., coke operators for smoke damage.

MELTING CAST-IRON IN CUPOLAS.

BY S. BOLLAND.

The cupola is now one of the most important factors in foundry economy. Its management commands the attention of the founder to a far greater extent to-day than it has ever done in the past. No matter what pains may be taken to insure a good and safe mold, every attempt in that direction will be neutralized if the molten iron supplied for filling it is not, in every sense, up to that standard of excellence which a right use of the materials employed warrants us to expect.

The truth of the above has been so often demonstrated, that any further allusion to the fact would be superfluous here.

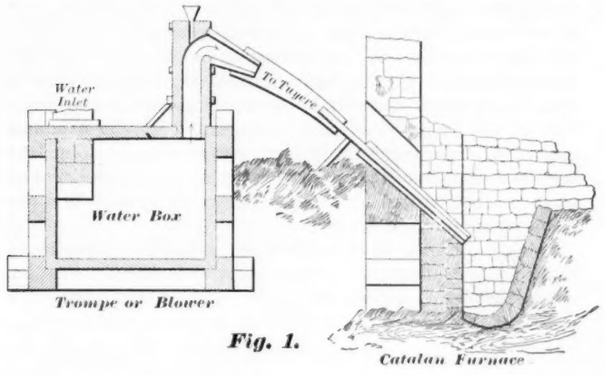
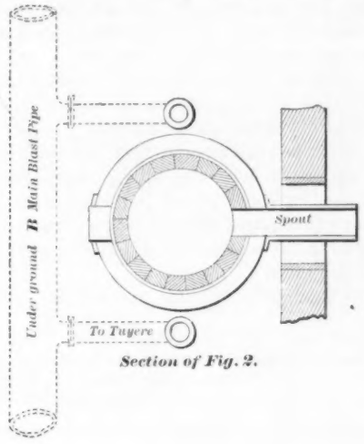
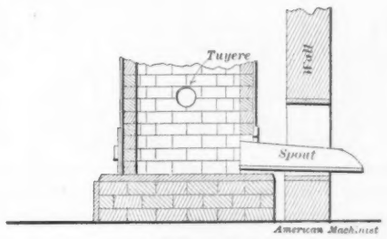


Fig. 1.



Section of Fig. 2.



Section of Fig. 2.

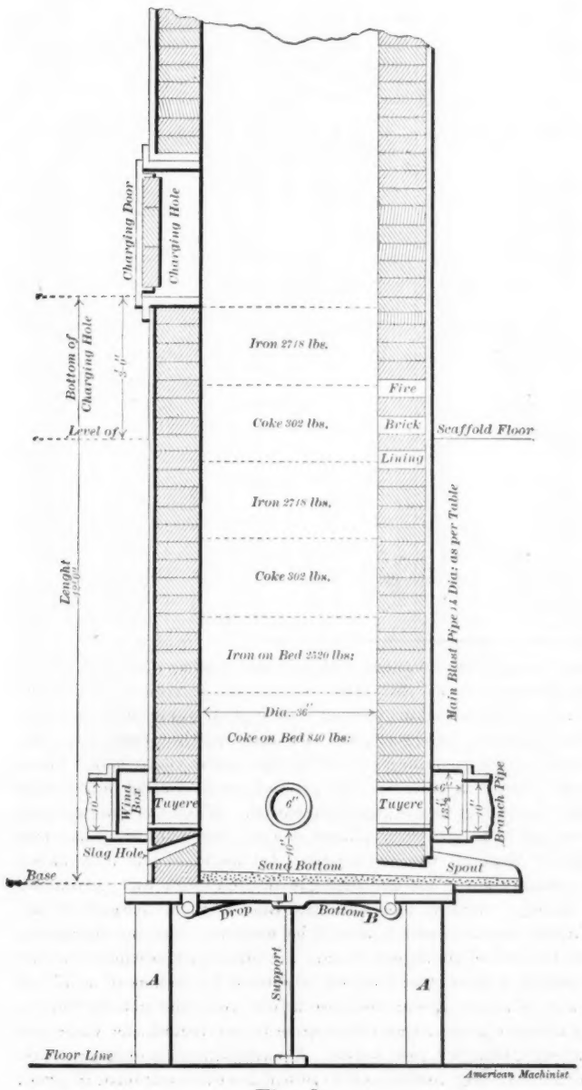


Fig. 3.

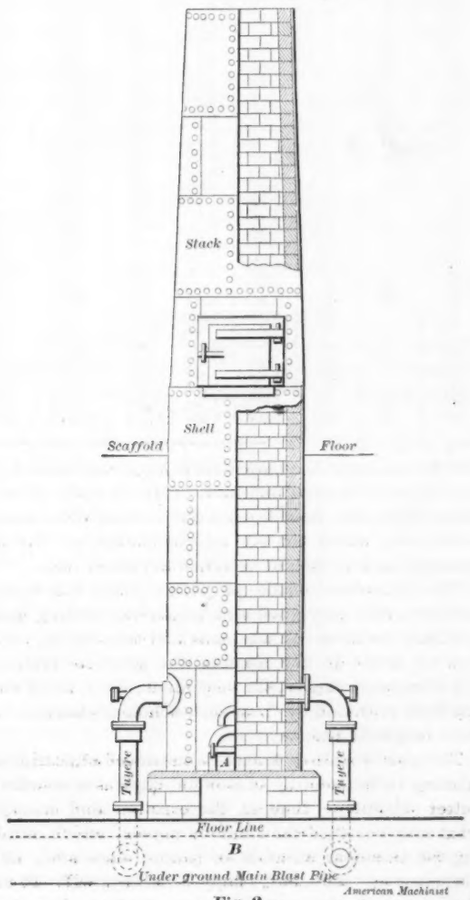


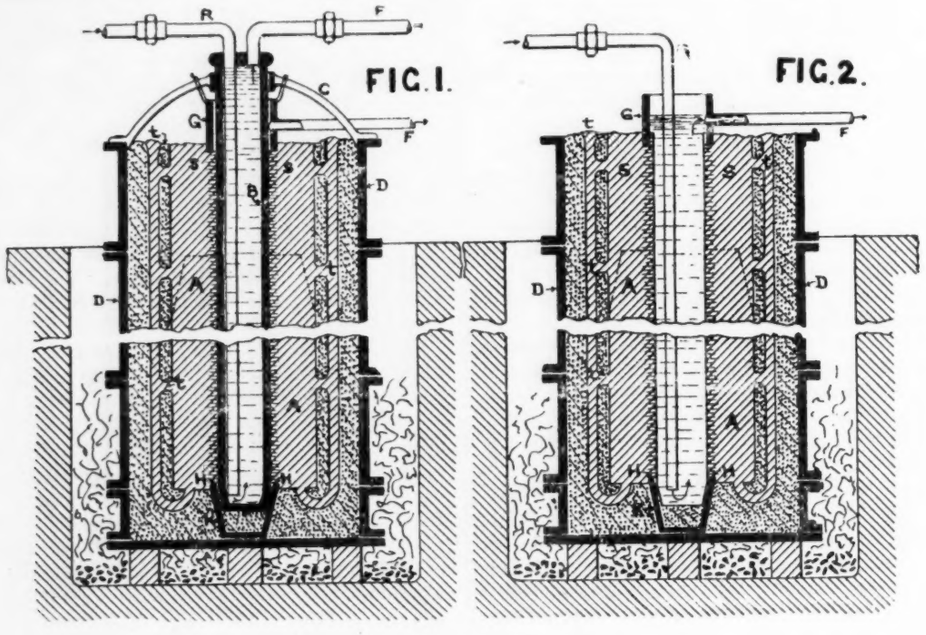
Fig. 2.

The science of melting in cupolas seems to have made very slow progress, until it was seen by some of the advanced thinkers on the subject that there was "money in it"; then the services of the engineer and scientist were enlisted in the

APPARATUS FOR CASTING CANNON.

An improved apparatus for casting cannon, the object of which is to relieve the opposing initial stresses, to prevent opposing lines of crystallization, to furnish an accurate and easy method of centering the core, and to lessen the waste of metal and the cost of casting, is in use at the Builders Iron Foundry, at Providence, R. I. It was invented by Mr. Richard A. Robertson, Jr., the treasurer of this well-known Providence establishment.

This invention relates to that class of castings in which a hollow core is used in connection with a mold, the cooling of the casting being accomplished from the interior, while the radiation of heat from the exterior is retarded. In the accompanying drawings, Fig. 1 is a vertical section through the center of the molding-pit, flask, mold, casting and core. Fig. 2 is a vertical section through the same after the core has been withdrawn, showing a cooling-pipe inserted in the bore.



APPARATUS FOR CASTING CANNON.

In the old, or Rodman process, of casting cannon, in which the method of cooling the casting from the interior was the basis, the core was suspended in the mold cavity, and a considerable distance was left between the lower end and the bottom of the mold. This case was held by a frame called a "spider," placed on the top of the molding pit. To centre the core in the mold cavity the "spider" was adjusted by screws. The core being of great length, a slight change of its position at the top made a much greater variation at its lower end, and rendered the centering of the core, in relation to the mold cavity, a work of difficulty. Its lower end being free, any irregularity in the flow of metal deflected the core from its position, and consequently, when the core was withdrawn the bore of the casting would be eccentric and the casting would be worthless for a cannon—a not infrequent occurrence. The buoyancy of a core of considerable length when held in suspension in a mass of liquid metal created a powerful upward pressure, and to prevent the displacement of the core, the spider and the adjusting screws had to be made of unusual strength. In the cooling of cannon cast in this way, the tendency of the lines of crystallization being to lie normal to the surfaces of the crystallizing mass, those lines extending from the sides of the casting diverged from those at the bottom of the casting at almost right angles. The result was that lines of weakness and irregular initial stresses were developed at the base of the casting. As a result it was necessary to cut off a large part of the casting so weakened at its base, while the effect of the different stresses near the escape pipe was not only to crack the metal in the sinking head, but frequently so far longitudinally as to ruin the whole gun.

In Mr. Robertson's apparatus, the remedy for these defects is the mechanism for cooling the casting uniformly at all times, throughout its entire length, from the bore outward, so that the lines of crystallization shall radiate from the bore normally to its contour at every point throughout its entire length. In the process of casting, the liquid metal is introduced into the mold-cavity as usual, through the gates or runners *l l* and attaches itself to or fuses itself with the projecting rim H of the pot K and also with the lower edge of the cylinder G, thus making them a part of the casting, Fig. 2. The inventor prefers this method of connecting the cylinder with the casting; but it may be made a part of the casting or otherwise joined—*e. g.*, the cylinder may be lowered into contact with the casting—and after a reasonable time the connection can be "luted" at the surface of the casting. The next step is to force water through the pipe R in the core B, which core was made hollow to carry said pipe and as a return-conduit for the cooling fluid, Fig. 1. After the core has been withdrawn from the casting, the cooling fluid is forced into the bore of the casting itself through a pipe R′ in the manner already described hereinabove. (See Fig. 2.) The hollow formed by the print in the pot after the core is withdrawn (or the hollow part itself, if no print is used) allows the water or other cooling fluid to flow beyond the lower end of the body of the casting, and the cylinder at the top of the casting (also a part thereof, as shown) permits the fluid to rise above the sinking head S and casting proper to the escape pipe F, Fig. 2. Since the cylinder and pot touch or nearly touch the outer surface of the core, it is evident that when they have been made a part of the casting the cooling fluid cannot touch any part of the casting proper except the bore, unless it be a very small part of the extreme outer ends of the casting at its top and bottom near the cylinder and receiver. Hence it follows, the fluid having been carried entirely through the bore of the casting and beyond the casting proper at both ends thereof, that the process of cooling will be uniform, that there is no intersection of different lines of crystallization, that the intensity of the initial stresses is made uniform, the formation of lines of weakness prevented, and consequently that there is no danger of losing a casting from these causes.

To Washington, D. C., via Pennsylvania Lines at Reduced Rates.

On July 16th and 17th excursion tickets to Washington, D. C., account meeting of League of American Wheelmen, will be sold from principal ticket stations on the Pennsylvania Lines at greatly reduced round trip rates, good to return until July 24th.

WEALTHY Cincinnati people got $3,750 verdict against North Bend, O., coke operators for smoke damage.

MELTING CAST-IRON IN CUPOLAS.

BY S. BOLLAND.

The cupola is now one of the most important factors in foundry economy. Its management commands the attention of the founder to a far greater extent to-day than it has ever done in the past. No matter what pains may be taken to insure a good and safe mold, every attempt in that direction will be neutralized if the molten iron supplied for filling it is not, in every sense, up to that standard of excellence which a right use of the materials employed warrants us to expect.

The truth of the above has been so often demonstrated, that any further allusion to the fact would be superfluous here.

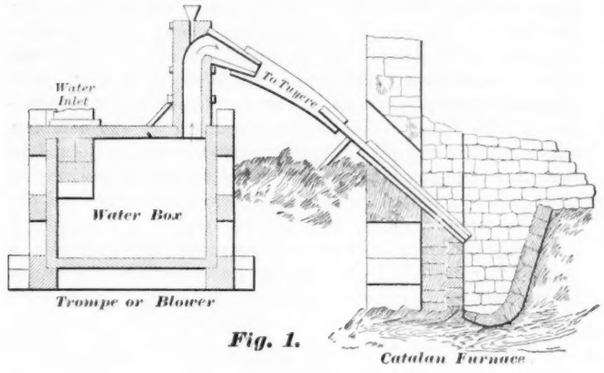
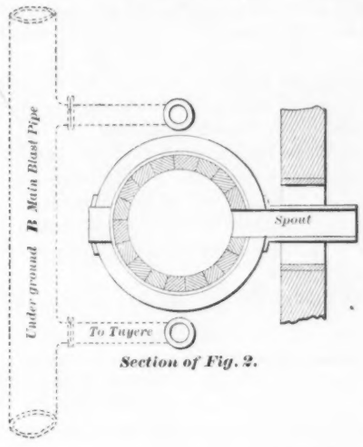
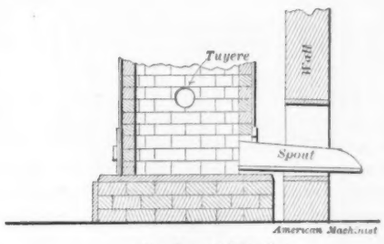


Fig. 1.



Section of Fig. 2.



Section of Fig. 2.

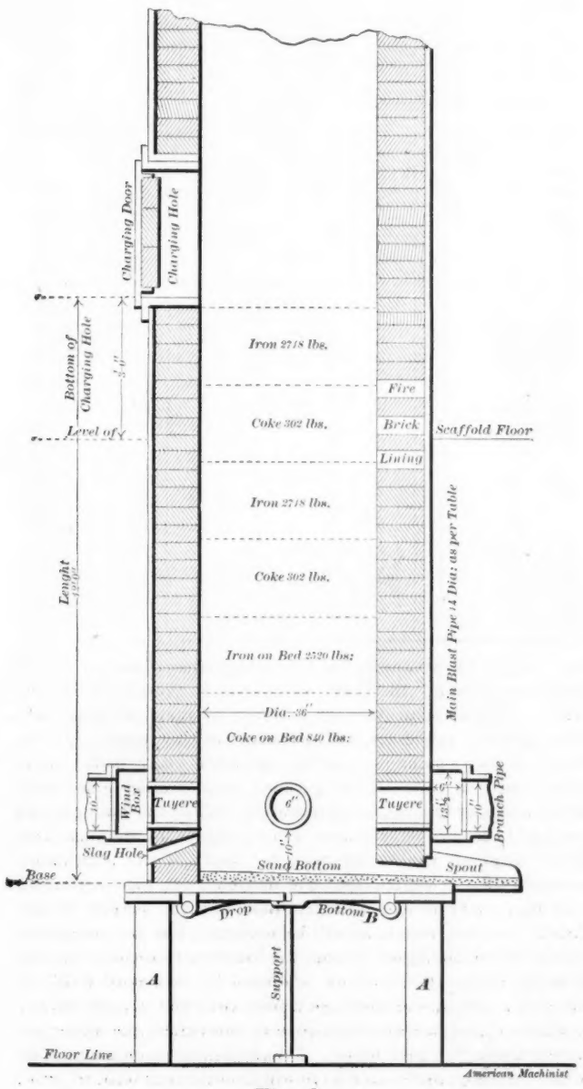


Fig. 3.

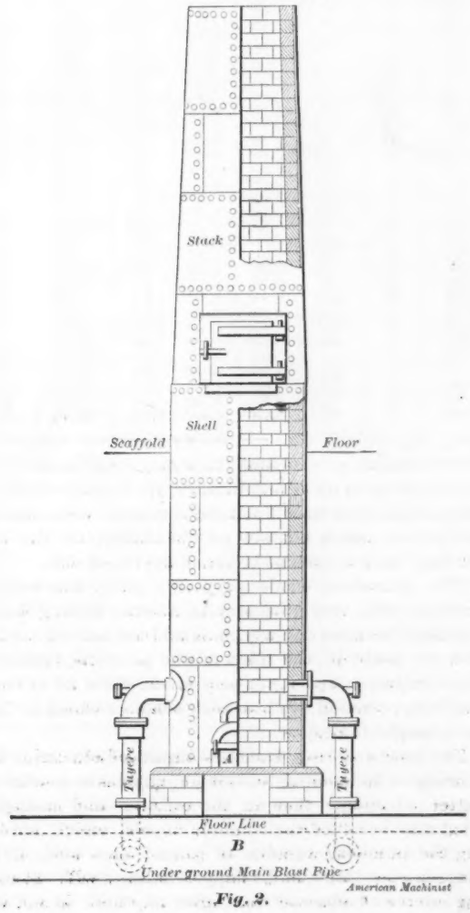


Fig. 2.

The science of melting in cupolas seems to have made very slow progress, until it was seen by some of the advanced thinkers on the subject that there was "money in it"; then the services of the engineer and scientist were enlisted in the

cause, and specialists in the manufacture of cupolas and blowers were to be found everywhere.

A result of this change in the order of things is that, instead of working, as has hitherto been the case, by the "rule of thumb," we are now enabled to measure, with a degree of accuracy almost marvelous, the air, fuel, capacity of cupola, and pressure of blast, etc., required to melt a given quantity of iron in a specified time. True, we do not always accomplish this with the degree of accuracy above spoken of, but in nearly every case of failure the cause may be traced to the non-fulfillment of the known conditions.

It must be remembered that the intelligence of the melter has not grown with the steady improvements now being established in nearly all of our leading establishments, consequently it requires the constant attention of foreman or manager to insure a correct manipulation of improved cupolas and their adjuncts.

The thoughtful founder has profited to an appreciable extent by reason of the claims for recognition made by the manufacturers of cupolas and blowers, for in order to substantiate such claims they have flooded the market with catalogues and pamphlets, which contain an elucidation of the science of melting, such as cannot be found anywhere else.

This literature, made purposely plain, has been read extensively with very good results, a better feeling has been established between the workman and the scholar, and there is now no doubt in the mind of the practical founder that the day of mystery is past, for very much, if not all of the mystery has been scattered by those very scholars whom he has always been taught to despise.

The good resulting from this improved education in matters relating to the melting of iron in cupolas is nowhere seen to better advantage than in the erection and management of what may be called the common cupola, which, notwithstanding the immense number of patent ones sold, still finds a place in every land, and, I suppose, always will. It must strike the interested observer that, after all, there is not very much difference in the construction of cupolas. Most of the so-called "improved" have made their debut within the last 35 years, and very many of them have, after a short trial, been changed back to the old-style, with considerable profit to those interested.

Others are simply "tolerated" because they are neither better nor worse than the old-style, and not a few of the really meritorious cupolas are producing minimized results from the simple cause that there is not sufficient intelligence expended on their management. In a number of cases, when the formulas furnished by the patentees for guidance in the management of their cupolas are followed to the letter, very excellent results ensue, both time and money being saved by adopting them; but as these formulas are carefully prepared by experts, and are, in the main, reliable, we need not inquire into their respective merits, but proceed at once to an exposition of the construction and management of the common cupola, for, on account of the extra cost of erection, joined to the strict management required for the successful working of most patent cupolas, there will, I presume, always be a demand for the former.

The blast furnace, in some form or other, has always had a place in the metallurgical arts, and dates back to the earlier dynasties of the ancient empire of Egypt; true, they were very simple contrivances, but that which was accomplished is made to appear all the more wonderful in view of their simplicity. The Catalan furnace is a type of some of these old-time smelting processes, and, primitive as they were, could be found in use in some parts of Europe a few years back; these were simply a hole in the ground, with walled sides into which a copper tuyere pipe penetrated. When the charcoal and ore had been properly placed within this hole, the blast was forced through the tuyere pipe by some of the antiquated methods then in vogue, until the molten iron was produced.

At Fig. 1 will be seen a longitudinal vertical section of the Catalan furnace, which, as will be observed, has no chimneys. On the left of the figure is seen the lower part of the tromp or blowing engine; the blast is produced by means of a fall of water of about 25 feet through a tube into the cistern below, to whose upper part the blast pipe is connected, the water escaping through a pipe below. This apparatus is on the outside of the building, and is said to afford a continuous blast of great regularity.

Now, if we continue the walls of this primitive contrivance, what do we obtain in reality other than the cupola of to-day, exact in every particular, so far as the principles involved for melting iron are concerned?

Fig. 2 shows sections and elevation of what was considered a good type of cupola 50 years ago, and of which type there

TABLE

SHOWING HEIGHTS, DEPTH OF BOTTOM, QUANTITY OF FUEL ON BED, PROPORTION OF FUEL AND IRON IN CHARGES, DIAMETER OF MAIN BLAST PIPES, NUMBER OF TUYERES, BLAST PRESSURE, SIZES OF BLOWERS AND POWER OF ENGINES, MELTING CAPACITY PER HOUR, AND TOTAL MELTING CAPACITY OF ALL CUPOLAS FROM 24 INCHES TO 84 INCHES IN DIAMETER.

Diameter of Cupola inside of Lining, in inches.	Height of Cupola from bottom plate to bottom of charging door, in feet.	Depth from sand bed to under side of Tuyeres, in inches.	Amount of Fuel required on bed, in pounds.	First charge of Iron, in pounds.	Succeeding Charges of Fuel, in pounds.	Succeeding Charges of Iron, in pounds.	Diameter of Main Blast Pipe when not exceeding 100 feet in length, in inches.	Number of Tuyeres 6 inches diameter required for each Cupola designated.	Number and Dimensions of Flat Tuyeres equivalent to the 6-inch round ones.		Blast Pressure required in Ounces.	Sizes of Root Blower, designated by their number.	Horse-Power of Engine to drive Root Blower.	Sizes of Sturtevant Blower, designated by their number.	Horse-Power of Engine to drive Sturtevant Blower.	Melting Capacity per hour, in pounds.	Total Melting Capacity, in pounds.
Inches.	Feet.	Inches.	Pounds	Pounds	Pounds	Pounds.	Inches.	No.	No.	Dimensions.	Ounces.	No.	H. P.	No.	H. P.	Pounds.	Pounds.
24	10	10	300	900	50	500	10	1.5	2	10" x 2"	6	2	5¼	2	1	1,500	6,000
26	10	10	390	1,170	92	828	10	2.	2	14½" x 2"	6	2	5½	2	1	2,000	8,000
28	10	10	480	1,440	134	1,206	10	2.6	3	12½" x 2"	6	2	5½	2	1	2,500	10,000
30	12	10	570	1,710	176	1,584	12	2.6	3	12½" x 2"	7	3	8	2	2	3,000	12,000
32	12	10	660	1,980	218	1,962	12	3.3	4	12" x 2"	7	3	8	2	2	3,500	14,000
34	12	10	750	2,250	260	2,340	12	3.3	4	12" x 2"	7	3	8	2	2	4,000	16,000
36	12	10	840	2,520	302	2,718	14	3.7	4	13½" x 2"	8	4	11½	4	3	4,820	18,280
38	12	10	930	2,790	344	3,096	14	5.	6	12" x 2"	8	4	11½	4	3	5,640	22,560
40	13	10	1,020	3,060	386	3,474	14	5.	6	12" x 2"	8	4	11½	4	3	6,460	25,840
42	13	10	1,110	3,330	428	3,852	16	5.8	6	11½" x 2½"	10	5	17¾	5	5½	7,550	30,200
44	13	10	1,200	3,600	470	4,230	16	5.8	6	11½" x 2½"	10	5	17¾	5	5½	8,640	34,560
46	13	10	1,290	3,870	512	4,608	16	6.8	6	13½" x 2½"	10	5	17¾	5	5½	9,750	38,920
48	13	10	1,380	4,140	554	4,986	18	6 8	6	13½" x 2½"	12	5	17¾	6	9¾	10,760	43,040
50	14	10	1,470	4,410	596	5,364	18	8.	8	11½" x 2½"	12	6	27	6	9¾	11,780	47,060
52	14	10	1,560	4,680	638	5,742	18	10.7	8	15½" x 2½"	12	6	27	6	9¾	12,820	51,280
54	14	10	1,650	4,950	680	6,120	20	10.7	8	15½" x 2½"	14	6	27	7	16	13,850	55,400
56	14	10	1,740	5,220	722	6,498	20	12.2	8	17½" x 2½"	14	6	27	7	16	14,880	59,520
58	14	10	1,830	5,490	764	6,876	20	12.2	8	17½" x 2½"	14	6	27	7	16	15,910	63,640
60	15	10	1,920	5,760	806	7 254	22	13.7	8	16½" x 3"	14	6	27	8	22	16,940	67,760
62	15	10	2,010	6,030	848	7,632	22	13.7	8	16½" x 3"	14	7	40	8	22	18,340	73,360
64	15	10	2,100	3,300	890	8,110	22	15.4	8	18½" x 3"	14	7	40	8	22	19,770	79,080
66	15	10	2,190	6 570	932	8,388	22	15.4	8	18½" x 3"	14	7	40	8	22	21,200	84,800
68	15	10	2.280	6,840	974	8,766	22	17.1	10	16½" x 3"	14	7	40	8	22	22.630	90,520
70	16	10	2,370	7,110	1,016	9,144	22	19.	10	18½" x 3"	14	7	40	8	22	24,060	66,240
72	16	10	2,460	7,380	1,058	9,522	24	19.	10	18½" x 3"	16	7	40	9	35	26.070	104,280
74	16	10	2 550	7,650	1,100	9,900	24	23.9	12	16½" x 3½"	16	Special for these sizes.		9	35	27 980	111,920
76	16	10	2 640	7,920	1,142	10.278	24	23.9	12	16½" x 3½"	16			9	35	29,890	119,560
78	16	10	2,730	8.190	1,184	10,656	24	26.	12	18½" x 3½"	16	Increase of power to suit Blower		9	35	31,800	127 200
80	16	10	2,820	8.460	1,226	11,134	24	26.	12	18½" x 3½"	16			9	35	33,710	134,840
82	16	10	2,910	8,730	1,268	11,412	24	28.	14	17" x 3½"	16			9	35	35,620	142,480
84	16	10	3,000	9 000	1,310	11,790	26	31.	16	16" x 3½"	16			10	48	37,530	150,120

are large numbers still working in England and other parts of the European continent, as well as still a few in some of the remote parts of this country. There is really no essential difference betwixt the cupola shown at Fig. 2 and that seen at Fig. 3, except that, instead of the bottom resting on a solid foundation, as at Fig. 2, the one at Fig. 3 is supported by four columns A, which allows for the dropping out of the whole contents of the cupola at once, swing doors B being provided for that purpose, whilst in the former case the cupola, when done working, must be raked out with hooks through large apertures A provided for the purpose.

Another feature which commands attention is the substitution of a wind box round the cupola, connecting with a system of pipes above, for the underground arrangement shown at B, B, Fig. 2; this allows for the multiplication of tuyeres or any other changes which experience may suggest, being made with very little trouble or expense.

A careful examination of Fig. 3, aided by the table which accompanies this article, will enable any one to build a cupola after the pattern shown, which pattern is, to all intents and purposes, what we may call a common cupola, in contradistinction to all such as are protected by letters patent.

Let us now consider in detail the various requirements for the erection and management of such a cupola.

LOCATION OF CUPOLA.

What shall be its capacity, and where shall it be located? are very important points to be considered. With regard to the latter query, due care should always be exercised to choose a location which will be equidistant from all its parts, for, whether the iron is carried in shanks, run on trucks, or changed from crane to crane in ladles, this disposition will give an equal and rapid distribution.

A very good axiom is that of Mr. Kirk's, who, in his very excellent work, "Founding of Metals," says: "It is easier to wheel pig iron to a cupola than it is to carry molten iron away from it."

CAPACITY OF CUPOLA.

The accompanying table will be of service in determining the capacity of cupola needed for the production of a given quantity of iron in a specified time.

First, ascertain the amount of iron which is likely to be needed at each cast, and the length of time which can be devoted probably to its disposal; and supposing that two hours is all that can be spared for that purpose, and that ten tons is the amount which must be melted, find in the column, Melting Capacity per hour in Pounds, the nearest figure to five tons per hour, which is found to be 10,760 pounds per hour, opposite to which, in the column, Diameter of Cupolas' Inside Lining, will be found 48 inches; this will be the size of cupola required to furnish ten tons of molten iron in two hours.

Or suppose that the heats were likely to average six tons, with an occasional increase up to ten, then it might not be thought wise to incur the extra expense consequent on working a 48 inch cupola, in which case, by following the directions given, it will be found that a 40-inch cupola would answer the purpose for six tons, but would require an additional hour's time for melting whenever the 10-ton heat came along.

Let it be understood that the quotations in the table are not supposed to be all that can be melted in the hour by some of the very excellently equipped cupolas now in the market, but are simply the amounts which a common cupola under ordinary circumstances may be expected to melt in the time specified.

HEIGHT OF CUPOLA.

What is meant by height of cupola is the distance from the base to the bottom side of the charging hole.

Height in cupolas is important, as all low cupolas lose a considerable amount of combustible gas which escapes unburnt, whereas when a sufficient height is allowed a large quantity of this gas mixes with the oxygen above and ignites, thus giving off heat available for combustion.

Should it be required to know what height to make a 50-inch cupola, find 50 inches in the column, "Diameter of Cupolas," opposite to which, in the column, "Height of Cupola" from base to bottom side of charging hole, will be found 14 feet, so that a 50-inch cupola should have a height of 14 feet.

The height of any other cupola from 24 inches to 84 inches diameter may be found in the same manner.—[American Machinist, June 30.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trade:

Cortland, N. Y.—Havens, Mead & Co., capital, $15,000; for the manufacture and sale of cash registers; Walter S. Havens, Albert D. Mead, Cortland, N. Y.; Daniel Mead, Genoa, N. Y.

Chicago, Ill.—Ratliff Advertising Co.; capital, $50,000; for general advertising business by wagons, vehicles, manufacture and sell same, own, buy and sell patented vehicles, etc.; incorporators: W. D. Carlile, Odd J. Ratliff, Mary A Ratliff.

Chicago, Ill.—Union Smoke Preventor Co.; capital, $100,000; to manufacture, sell and apply smoke preventing and fuel saving attachments to furnaces; incorporators: Frank T. Robinson, John H. Kinzie, A. L. Woodward.

Cleveland, O.—The Cleveland Copper Ferrule Co.; capital, $5,000; for manufacturing copper boiler tube ferrules and dealing in same; incorporators: H. N. Hill, F. Hohlfelder, Frank C. Cain, W. B. Whiting, Harrison B. McGraw.

Cleveland, O.—The Cleveland Ice & Refrigerating Co. (incorporated in West Virginia); capital, $150,000; for the purpose of manufacturing and dealing in refrigerators, etc.; incorporators: Chas. H. Tucker, Jas. H. Hoyt, H. S. Sherman, Cleveland, O.

Hamilton, O.—The Hamilton Carriage Co.; capital, $18,000; for manufacturing and dealing in carriages, buggies, wagons and vehicles of every description; incorporators: Edgar A. Belden, Robt. N. Shotts, Jas. Fitton, I. N. Slayback, Brandon R. Milliken.

Chicago, Ill.—National Stamp Vending Co.; capital, $50,000; for the manufacture, sale and lease of coin controlled vending machines, etc., general merchandise, general advertising business; incorporators: Alex S. Kibby, Francis M. Shaw, Wm. E. Rhodes.

Chicago, Ill.—Chicago Machinery & Iron Co.; capital, $100,000; to manufacture, buy and sell iron and steel, new and second-hand tools, machinery, scrap iron and metals and deal in patents; incorporators: A. Egerton Adams, Carl Jernberg, Otto W. Modeen.

Chicago, Ill.—Acme End Gate Manufacturing Co., Chicago, Ill.; capital, $15,000; to manufacture, buy and sell patents and patented articles of hardware, wagon specialties, light agricultural implements; incorporators: Joseph H. Senn, L. B. Smith, H. V. Smith.

Chicago, Ill.—Elevated Suspension Railway Co.; capital, $4,000,000; to operate and build electric elevated suspension and dummy railways, under patents issued to Lysander Johnston and Raleigh Clapp, etc.; incorporators: Lysander Johnston, Gustine I. Ladd, Henry A. Buell.

Youngstown, O.—The Ohio Steel Co.; capital, $750,000; for manufacturing and dealing in metals and the products thereof; operating mines and coke works; dealing in merchandise; incorporators: L. E. Cocheran, Jos. G. Butler, Jr., Myron C. Wick, Henry Wick, H. O. Bonnell.

New York City, N. Y.—Wilder Electric Hotel Co., capital, $50,000; for the manufacture and sale of hotel, messenger and other calls and burglar alarms: incorporators: Edmund R. Wilder, 165 Broadway; Edward White, 175 Broadway; Chas. J. Pearson, 120 Broadway; all of New York City, N. Y.

New Kensington, Pa.—The New Kensington Traction Co.; capital, $2,000; for the construction and operation of motors and cables or other machinery for supplying motor power to passenger railways, and the necessary apparatus for applying the same; incorporators: S. E. Moore, Jas. P. Anderson, Howard Childs, Pittsburgh, Pa.

Schenectady, N. Y.—The United States Wire & Cable Co.; capital, $1,000,000; for the manufacture and sale of wire, wire rope, cables, conductors and every kind of wire used in connection with electrical apparatus; incorporators: Benj. E. Sunny, Chicago, Ill.; Silas A. Barton, Boston, Mass.; Samuel Insull, 44 Broad street, New York City, N. Y.

News of New Enterprises, Machinery Wants, Etc.:—

Ledig & Way, of Philadelphia, Pa., manufacturers of bronze and brass castings, silver, nickel, brass and copper goods,

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ⁜ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Lewis Block, Pittsburgh, Pa.

have become an incorporated company, under the title, Ledig Manufacturing Co.

The re-organized Chattanooga (Tenn.) Tool Co. has ample capital and will probably put the plant in operation at an early day.

The Tight Joint Co. has been capitalized at New York City with $100,000 for the manufacture of elbows, joints, steam fittings, etc.

Robert Ewing and others have incorporated the Metal Refining Co., at Nashville, Tenn., to manufacture and refine iron and other metals.

The National Manufacturing Co. has been chartered at Knoxville, Tenn., to manufacture an engine patented by Mr. Tubbs, of Front Royal, Va.

The Columbian Facing mills, to be built at Buffalo will probably be the most complete plant in the world for the manufacture of this class of goods. The Buffalo Foundry Supply Co. will erect them.

It is thought that the New Castle, Pa., steel mill will be completed about August 1. About 300 men will be employed. Its output will be nearly equal to all the combined production of the iron industries of New Castle.

The Columbia Scale Co., recently incorporated at Council Bluffs, Ia., to manufacture stock and wagon scales, have their plant erected and machinery in operation. Their foundry is 30x60 feet, and they have, in addition, a two-story building 50x80 feet, and a one-story building, 40x70 feet, all of brick.

Additions, Enlargements, Removals, Etc.:—

The National Tube Works, of McKeesport, Pa., will erect an addition to its plant on the site of the old Tubular Axle Works, which is being removed to Harrisburg, Pa.

Extensive enlargements are being made to the shops of the Janesville Machine Co., at Janesville, Wis. The capacity of the foundry has been doubled, and several smaller buildings have been built.

The capacity of the Wright Steam Engine Works, Newburgh, N. Y., has been doubled by the building of the new shops just completed. The machine shop is 200x400 feet and equipped with modern tools.

The Walburn & Swenson Manufacturing Co. will remove its works from Fort Scott, Kan., to Chicago, Ill. It does a general foundry business, and manufactures mining and sugar refining machinery, employing 200 men.

Fires and Accidents:—

H. J. Anthony's machine shop, at Gloversville, N. Y., has been destroyed by fire.

The large chain works at Riverton, Pa., which started in April, have burned down.

The Dow Wire Works, Louisville, Ky., were completely gutted by fire on the 2d inst. The loss is estimated at $60,000.

The Illinois Steel Works, at South Chicago, suffered from two explosions in the furnace-room last week, Wednesday. One man was killed and three injured. The first explosion occurred at 10 A. M., while the molten metal was being released from the furnace, the three injured men being in attendance. The red hot liquid was scattered in all directions, portions of it striking the three men. Only a short hour afterward, the second explosion occurred and a man who was working but a few feet from the mouth of the tub received the full force from it, dying almost instantly.

The puddling department of Singer, Nimick & Co.'s mill, at Pittsburgh, was totally destroyed by fire. Loss is about $10,000, fully insured.

The freight car erecting shop of the Nashville, Chattanooga & St. Louis Railroad, at Nashville, was destroyed by fire. Loss about $12,000.

At Sligo Furnace, Sligo, Dent County, Mo., the coal house, casting house and small outbuildings were demolished by the recent tornado, and the smoke stacks all torn down. The stack was shoveled out on June 25.

General Industrial Notes:—

The Columbus (O.) Wheel Co. has increased its capital stock from $40,000 to $100,000.

Hecla charcoal furnace, at Ironton, O., has started up after being idle since November.

The Detroit Iron Furnace Co., of Detroit, Mich., put its furnace out of blast for repairs last month.

The Pen Argyl, Pa., Iron Works, which have been idle on the yearly two weeks' vacation, resumed on July 11.

The office of the Stiles & Parker Press Co. has been removed to that of the E. W. Bliss Co., 17 Adams street, Brooklyn.

Work on the new blast furnace for the Union Iron Works, at Buffalo, is progressing rapidly, and the plant will be in operation by October.

One of the furnaces of the Lackawanna Iron & Steel Co., at Scranton, blew out June 23 for alterations and repairs, leaving four furnaces at work.

The Ashland Iron & Steel Co., Ashland, Wis., have appointed N. W. Gray, Manager, and L. E. Dunham, Assistant Manager of the Hinkle Furnace at Ashland, Wis.

The town council of Casper, Wyo., will receive bids until 12 M., August 1, for the steel and iron work for the proposed town jail. E. J. Carpenter, Jr., is town clerk.

The blast furnace of the Lehigh Iron Co., at Allentown, Pa., was sold July 1, to the Second National Bank, of Allentown, for $45,000, to satisfy judgments aggregating $235,000.

No. 3 blast furnace of the Pennsylvania Steel Co., at Steelton, Pa., blew in June 30, and is now working very satisfactorily. All four furnaces of the company are now in operation.

The Wellman Iron & Steel Co. now has in operation at its mills in Thurlow, Pa., the largest plate rolls in the country. The mill can turn out plates 126 inches in diameter and 70 feet long.

A Chicago firm has just received a lot of plates from the Lukens Iron & Steel Co., of Coatesville, Pa., some of which are

PROTECTING YOUR BUILDING with an automatic fire sprinkler system makes it absolutely fire proof. All Insurance Companies recognize the "Neracher" as the best made and will make liberal reductions on your present rates if you equip. In this way the system pays for itself inside of two years' time. ☞ Write us.

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WARREN, O.

BRANCH OFFICES:

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said to be wider than any ever before received in that city. The plates are 108 inches wide, from 190 to 238 inches long, and five-sixteenths of an inch thick.

Among furnaces recently blowing out or banking are the Belmont, at Ironton, O., to resume September 1; Norton, at Ashland, Ky.; Crown Point (N. Y.) Iron Co.'s second stack; Tropic, at Jackson, O.; one stack of Lackawanna Iron & Steel Co., Scranton, Pa.; Minneapolis furnace, at Black River Falls, Wis.

Word received at Anniston, Ala., from President Cornfoot, of the United States Car Co., successors to the United States Rolling Stock Co., is, that the various plants will be started up at once. The new company, which is composed of nearly all the creditors and bondholders of the old company, has unlimited means.

The Akron Belting Co., Akron, O., has made a satisfactory adjustment with insurance companies, of losses sustained by its recent fire, the insurance fully covering them. Operations will be resumed as soon as repairs can be made. Meantime orders are being filled from stock stored in a building that the fire scarcely touched.

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until 2 o'clock, P. M., August 2, 1892, for all the labor and materials required for the excavation, foundations, cut stone and brick work, iron and wood floor and roof construction, roof covering, approaches, etc., for the U. S. Post Office building, at Fort Dodge, Ia.

The Akron Tool Co., of Akron, O., have just shipped six large-sized McNeil patent balanced charging barrows, of over a ton capacity, to the Alabama & Midland Railroad Co., Montgomery, Ala., to equip one of their coaling stations and are just in receipt of an order from the Cleveland, Akron & Columbus Railroad Co. for 15 of the same pattern to equip their coaling station being erected at Mount Vernon.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 P. M., August 3, 1892, for all the labor and materials required for the stone and brick work, roof covering, approaches, etc., for the superstructure, and also for the cast iron columns, steel floor, ceiling and roof construction, etc., of the United States court house and postoffice building, at Wilmington, Del.

The Cleveland office of the Babcock & Wilcox Co., has closed a contract with the Coleman, Shields & Co., of Niles, O., for three Babcock & Wilcox boilers, triple deck, water tube steam boilers for utilizing waste heat. This triple deck type of the B. & W. boiler is designed especially for the utilization of waste heat, and is an extremely economical boiler in space occupied, a 125 horse-power boiler occupying ground space of but 6′10″x10′6″.

The Syracuse Supply Co., handling the pulleys of the Great Western Pin Co., Toledo, O., were awarded the contract for all the pulleys for the new factory erected by D. M. Osborne & Co., Auburn, N. Y. There were seven other makes of pulleys competing. The Great Western Pin Co. have just put in also some very large pulleys for extra heavy work for Hunter Arms & Co., Fulton, N. Y. Their pulley being made with iron hub is particularly adapted for work of this kind.

Two mammoth hydraulic presses for forging steel ingots into various shapes have recently been built. One is in operation at Bochum, Prussia, and the other at Montlucon, France. Each has a compressing power of 4,000 tons. It is claimed that the work performed by one of these presses is about double that of a steam hammer of equal power in the same time, and that the consumption of steel and cost of maintenance are considerably less.

We have received from Messrs. Clark & Co., 323-325 Dearborn street, Chicago, samples of their advertising specialties, in the shape of a paper-weight and a paper cutter. The former is of glass, the "ad." showing through the top. The paper cutter is nickel-plated, of a size handy to use, and has the advertisement engraved in large letters on one side. To anyone desiring this class of advertising, Messrs. Clark & Co.'s specialties are worth investigating.

A contract has been closed between the Gas City Land Co., of Gas City, Ind., and E. Morewood & Co., of Wales, which insures the establishment at Gas City of the largest single tin plate works of the world. The Gas City Land Co. has bought up 1,600 acres of land. The plant with the iron foundry and steel works will cover fifty acres. It will cost $1,000,000, and will employ 1,600 men. John H. Royers, a member of the firm of E. Moorewood & Co., has been in this country making the deal.

The York Iron Co. shut down their furnace at Black River Falls, Wis., on July 3d. The furnace has been running for nearly six years, making an average of 25,000 tons of pig iron annually. About 100 men have been employed. For some time the managers have talked of moving, as the freights were a great obstacle, their freight bills amounting to from $90,000 to $125,000 annually. An effort was made by citizens to raise money to make a thorough search for ore, but they have so far been unable to raise a sufficient amount. The company was given $12,500 in cash and 20,000 acres of land as a bonus for locating at Black River Falls.

Among the shipments made from the shops of the Leechburg Foundry & Machine Co. the past week were the 22-inch

MUNCIE, INDIANA

OFFERS THE FINEST FIELD FOR INVESTMENT TO BE FOUND IN THE WEST.

FACTORIES EMPLOYING 3,000 MEN

Have been located here within the past four months.

5,000 Additional Factory Hands will be Added within a Year.

The Population of the City, now 15,000, will be doubled within Two Years.

1000 NEW HOUSES ARE NEEDED NOW.

From 15 per cent. to 20 per cent. can be realized from rents, and the rents guaranteed by the manufactories. Fine residence lots for sale on reasonable terms. Call on or write,

THE MUNCIE LAND COMPANY,

MUNCIE, INDIANA.

sheet mill and 22-inch cold mill to Wallace, Banfield & Co., which were mentioned in a recent issue. Also a Mesta patent pickling machine to the Cannonsburg Iron & Steel Co. and one to the United States Iron & Tin Plate Works, Demmler, Pa. In a few days the company will ship a Mesta machine to Marshall Bros., Philadelphia. Two large double spiral gear wheels weighing 15 tons, were cast this week for the Blairsville tin plate plant, and will be put in place in a few days, and the mill started as the other machinery already is in position.—[American Manufacturer.

There is a question, both as to the make-up of the Delta Steel & Iron Manufacturing Co., that has promised Escanaba a big plant in consideration of certain local concessions, and as to the ability of those who have carried on the negotiations on the part of the company, to execute their promises. August Pollak, of Chicago, whose name had been used as a promotor of the enterprise, says that for three weeks he has heard nothing of the matter from the persons who induced him to associate himself with it, and that he has determined to have no connection with it. He says that several St. Louis, Cincinnati and Buffalo capitalists went into it on seeing that he had gone in, and adds that he does not know what they will do. There is a feeling abroad that the plant will not be built at any early day.

Evolution of Structural Iron.

In 1845 Peter Cooper erected the largest rolling mill at that time in the United States, for making railroad iron, and at this mill he was the first, soon afterward, to roll wrought iron beams for fireproof buildings. In the building of the Cooper Institute in New York City, in 1857, he was the first to employ such beams with brick arches to support the floors, in a large structure, designed to be fireproof. In this building, however, as in all similar structures up to a very recent period, the walls were depended upon to furnish the principal support of the several floors and give the necessary strength and stability to the building. Such dependence upon the walls alone has been found to be increasingly difficult and vastly more expensive with every addition to the height of the building; and where it was necessary to make the walls at the first story, four or five feet or more thick, as has often been the case in eight or nine-story buildings, a large proportion of the most valuable room was thus taken up.

The modern method of building obviates this difficulty, and enables the architect to put up structures twenty or more stories high having every desired element of strength and stability, but with the walls forming only a mere shell inclosing the building, and in no way depended upon for its support. This is accomplished by making a good foundation for each of the iron columns of the interior, the weight of the structure in all its parts being carefully figured out, with due allowances for the uses to which the building is to be put, and the several foundations for interior pillars, columns and piers being prepared in accordance with the manner in which the weight and strains of the completed building will be distributed. In this way of building the walls are only intended to support their own weight, serving such purposes of ornamentation or embellishment as may be sought, the openings for the admission of light and air to the interior being largely increased, or, as has been followed in some cases, the exterior may be formed almost entirely of glass.—[Scientific American.

Engineers' Licenses in Chicago.

The City Council of Chicago has just passed an ordinance requiring all engineers and boiler tenders to secure licenses. An applicant for an engineer's license must be a machinist or engineer having at least two years' practice in the management, operation or construction of steam engines and boilers. An applicant for a boiler tender's license must be a person who has a thorough knowledge of the construction, operation and management of steam boilers. Each applicant must be at least 21 years of age, a citizen of the United States, or have declared his intention to become such; must be of temperate habits and good character. An examining board to consist of three practical engineers, appointed by the Mayor, is provided for by the ordinance; each member of the board to receive $1,500 per year. The board has power to grant licenses, and for cause, to suspend or revoke them.

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Gives the best oil fire. Does not increase insurance. 200 Plants in use for 50 varieties of work. Forging and tempering a specialty. Send for Catalogue I to Hall Steam Pump Co., Pittsburg. **GILBERT & BARKER MFG. CO., General Agents for the U. S., Springfield, Mass.**

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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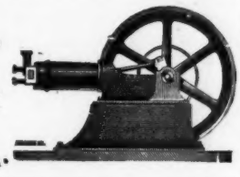
No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 100 horse-power. } **Can be Used in City or Country.**

In conjuction with our Producer Gas Apparatus, we guarantee coal consumption of 1½ pounds per hour per h.p.



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Extra Low Phosphorus Bessemer	$ 6.00
No. 1 Specular, Bessemer quality	$5.00@$5.65
No. 1 Bessemer hematite	$4.25@$4.50
Minnesota Bessemer hematite	$ 4.85
Soft hematites No. 1 non-Bessemer	$3.50@$ 3.75
No. 1 Specular, Non-Bessemer	$4.00@$4.50

PIG IRON.

CLEVELAND (f. o. b.) cars, Bessemer, $14.25@$14.50; No. 1 Strong Foundry, $14.75@15.75; No. 2 Strong Foundry, $13.75@$14.25; No. 1 Grey Forge, red short, $13.50@$13.75; No. 2 Gray Forge, neutral, $13.00@13.50; No. 1 American Scotch, $15.60; No. 2 American Scotch, $14.50@$15.00; Lake Superior Charcoal, $17.00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $15.00@15.25; No. 2 Foundry, $14.00@14.25; Grey Forge, $ 2 75@13.00; White and Mottled, $12.00@12.25; Warm Blast Charcoal, $18.00@22.00; Cold Blast Charcoal, $22.00@28.00 · Bessemer, $14.25@00.00.

CHICAGO (reported by Messrs. Rogers, Brown, & Merwin): Southern Coke No. 1, Foundry, $15.75@16.50; Southern Coke No. 2, Foundry, $14.50@$15.25; Southern Coke No. 3, Foundry, $00.00@00.00; Southern Coke No. 1, Softeners, $14.50@15.25; Southern Coke No. 2, Softeners, $13.50@14.25; Ohio Silveries No. 1, $17 50@18.50; Ohio Silveries No. 2, $16.50@17 50; Ohio Strong Softeners, No. 1, $16.75@$17.50; Ohio strong Softeners, No. 2, $16.25@$17.00; Lake Superior Charcoal Nos. 1 and 6, $17.00@18.00; Tennessee Charcoal No. 1, $17.00@18.00; Tennessee Charcoal No. 2, $16.50@17,50; Southern Standard Car Wheel, $21 00@23.00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke No. 1, Foundry, $13.50@14.00; Southern Coke No. 2 and No 1 Soft, $12.50@13.00; Hanging Rock Coke No. 1, Foundry, $16.00@16.50; Jackson Co. Stone Coal No. 1, Foundry, $16.50@17.00; Tennessee Charcoal No. 1, Foundry, $16.75@17.00; Hanging Rock Charcoal No. 1, Foundry, $19.75@20.00. MILL IRONS—Standard Southern Coke, Grey Forge, $11.50@12.00; Standard Southern Coke, Mottled, $11.25@11.75; Cold Short Southern Coke, Grey Forge, $11 75@12.25; Strong Ohio Neutral Coke, Grey Forge, $15.00@15.50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $18 or @19.00; Tennessee Car Wheel, $17.00@17.50; Lake Superior Car Wheel $17.50@18.00.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley, strong, No. 1 Foundry, $15 75@00 00; Mahoning and Shenango Valley, strong, No. 2 Foundry, $14 75@00.00; Ohio Softener No. 1, $15.75@00.00; Ohio Softener No. 2, $14.75@00.00; Jackson Co. Silvery, No. 1, $18.00@00.00; Jackson Co. Silvery, No. 2, $17.00@00.00;

Lake Superior Charcoal, $16.50@00.00; Tennessee Charcoal, $17.00@00.00; Southern Softener No. 1, $14.65@00.00; Southern Softener No. 2, $00.00@00.00; Southern Strong, No. 1 Foundry, 00.00@00.00; Southern Strong, No. 2 Foundry, $00.00@00.00; Alabama Car Wheel, 19.00@00.00; Hanging Rock Charcoal, $20.50@00.00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern Coke No. 1, $14.00@11.25; Southern Coke No. 2, $13.00@13.25; Southern Coke No. 3, $12.75@13.00; Southern Charcoal No. 1, $16.00@17.00; Southern Charcoal No. 2, $15.50@16.00; Missouri Charcoal No. 1, $17.00@17 50; Missouri Charcoal No. 2, $16.50@17.00. FORGE—Neutral Coke, $12.50@12.75; Cold Short, $12.25@12.50; Mottled, $11.50@12.00. CAR WHEEL AND MALLEABLE—Southern (standard brands) $20.00@$21.00; Southern (other brands) $18.50@19.50: Lake Superior, $19.50@20.50.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $14.25@14.50; Southern Coke No. 2, $13.25@13.50; Southern Coke No. 3, $12.75@13.00; Southern Grey Forge, $12.25@12.50; Southern Charcoal No. 1, $16.00@16.50; Southern Charcoal No. 2, $15.50@16.00; Missouri Charcoal No. 1, $14.50@15.00; Missouri Charcoal No. 2, $14.25@15.50; Ohio Softeners, $17.00@17.50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $18.00@18.25; Southern, $18.75@19.25. CONNELLSVILLE COKE—St. Louis, $5.65.

DETROIT (reported by William F. Jarvis & Co.:) Lake Superior Charcoal, all numbers, $16.50@17.00, Lake Superior (coke) Bessemer, $16.00@17.00; Lake Superior Coke, Foundry, all ore, $16.50@$17.00; Standard Ohio Black Band, $17.00@17.50; Southern No. 1, $15.00@15.50; Southern Grey Forge, $13.25@13.75; Jackson County (Ohio) Silvery, $17.75@18.25.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry, $13.75@14.25; Southern Coke No. 2 Foundry, $12.75@13.25; Southern Coke No. 3 Foundry, $12.00@12.50; Grey Forge, $11.50@12.00; Southern Charcoal No. 1 Foundry, $15.75@16.75; Car Wheel, $18.00@19.00.

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	Net Tons
No. 1 R. R. wrought scrap	$15 00
No. 1 wrought scrap	14 50
No. 1 Machine cast scrap	10 00
Iron axles	19 00
Axle turnings	11 00
Wrought turnings (free from cast)	8 50
Cast borings	6 50
Uncut wrought iron boilers	9 00
Steel boiler Plates	13 00
Grate bars	7 00
Pipes and flues (clean)	10 00
Tank iron	11 00
Hoop and band iron	8 00
Sheet iron	7 00
Wrought drillings	8 00
Malleable iron	9 00

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 65
4¼ to 6 by ⅜ to 1 inch	1 80
1¾ to 6 by 1⅛ to 2 inch	2 10
1¼ & 1⅜ by ⅜ to ¾ inch	1 80
1 & 1½ by ⅜ to ¾ inch	1 90
⅝, ⅜, ⅞, by ⅜ to ⅝ inch	2 10

Round and Square.

1 to 1⅞ inch	1 70
2 to 2⅝ inch	1 90
2¾ to 3¼ inch	2 20
3⅜ to 4 inch	2 70
4¼ to 4½ inch	3 20
4¾ to 5 inch	3 40

Oval.

⅝ to 1¼ inch	2 10
⅝ to ¾ inch	2 20
½	2 50
⅝	2 90

Half Oval and Half Round.

⅛ to 3 inch	2 80
⅜ to 1½ inch	2 40
⅝ to ¾ inch	3 00
½	3 20
⅜	4 70

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 90
1 to 1⅜ by ¼ and 5-16 inch	2 00
¾ to ⅞ by ¼ and 5-16 inch	2 20
½ to ⅝ by ¼ and 5-16 inch	3 70

Hoops.

1¾ to 4, Nos. 13 to 15	2 50
1¼ to 2, Nos. 16 to 18	2 60
1¼ to 2. No. 19	2 70
1¼ to 2, No. 20	2 80
1¼ to 2, No. 21	2 90
1¼ to 2, No. 22	3 00
15-16, 1 and 1⅛, Nos. 13 to 15	2 70
15-16, 1 and 1⅛, Nos. 16 to 18	2 80
15-16, 1 and 1⅛, Nos. 19 and 20	2 90
15-16, 1 and 1⅛, No. 21	3 00
15-16, 1 and 1⅛, No. 22	3 10
⅞, Nos. 13 to 15	2 90
⅞, Nos. 16 to 18	3 00
⅞, Nos. 19 and 20	3 10
⅞, No. 21	3 20
⅞, No. 22	3 30
13-16, Nos. 13 to 15	3 10
13-16, Nos. 16 to 18	3 20
13-16, Nos. 19 and 20	3 30
13-16, No. 21	3 40

THE STIRLING COMPANY

MANUFACTURE

The Safest, Most Economical, Compact and Durable High Preasure

WATER TUBE BOILERS.

All Wrought Steel. Large Mud Drum. Perfect Circulation.

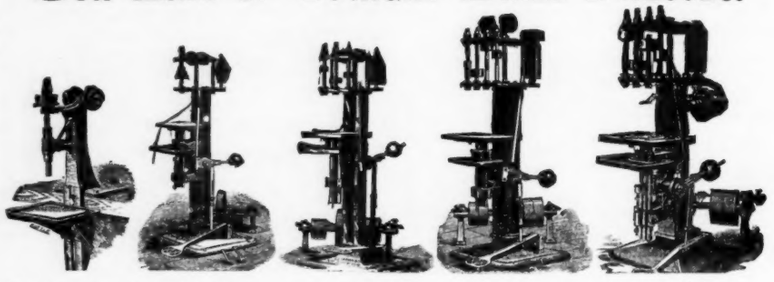
By removing four manhole covers access is gained to every part of the boiler Dry steam and great economy of fuel guaranteed.

GENERAL OFFICE: Pullman Bldg., Chicago. PITTSBURGH OFFICE: Lewis Block. NEW YORK OFFICE: 74 Cortland St.

CLEVELAND OFFICE: Bradley Block.

Works: BARBERTON, SUMMIT COUNTY, OHIO.

OUR LINE OF UPRIGHT DRILL PRESSES.



Light Bench or Post Drill | No. 1 Drill Press. 1 or 2 Spindles. | No. 2 Drill Press. | No. 3 Drill Press. | No. 4 Drill Press.

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Manufacturers of, and Dealers in, all kinds of

MACHINERY AND MACHINE TOOLS.

Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Profilers, Chucking Machines, Gear Cutters, Die and Cutter Grinders, Tapping Machines, Wire-Spring Coilers, Milling Cutters, etc.

Plants for Manufacturers of Sewing Machines and Electrical Goods.

Gear Cutting and Milling in all its Branches.

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THE JAMES LEFFEL & CO. Manufacturers of

IMPROVED UPRIGHT and HORIZONTAL

ENGINES & BOILERS

3 TO 26 HORSE POWER.

STRONGLY BUILT on BEST Principles for SMOOTH and ECONOMICAL WORK.

Over 4000 in Use.

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SPRINGFIELD, OHIO or NEW YORK CITY.

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Nos. 1251 to 271 W. Front St., CINCINNATI, OHIO.

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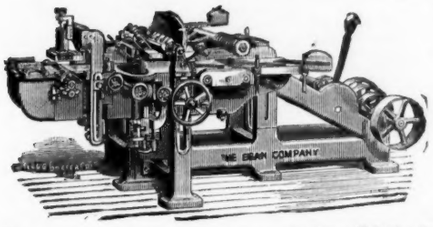
Wood - Working Machinery.



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Meeting the requirements of

PLANING MILLS,

SASH, DOOR AND BLIND FACTORIES

PATTERN SHOPS,

GENERAL WOOD-WORKERS, ETC.

With the latest and most advanced type of machines for fast and perfect work.

New "Standard Moulder," Four Sided.

4, 6, 7, 8, 9, 10 and 12 inch. Geared feed rolls, two above and two in table. Slotted steel heads.

Catalogue and information sent on application.

SAY! WANT TO TICKLE YOUR TRADE? Send 'em one of our Elegant Specialties. They are PERMANENT "ADS" and indispensable to every Business Man. Complete set samples $1.50, prepaid. Rebate on order of $25.00 or over. Write us.

CLARK & CO., Mfrs. Advertising Specialties in all Materials.

323 AND 325 DEARBORN ST. - - - CHICAGO, ILL.

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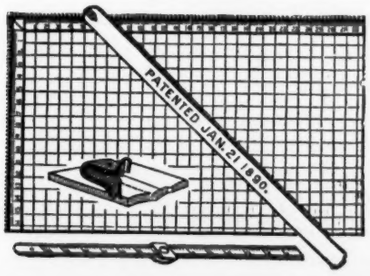
WHO come in contact with the iron trade can find out how their incomes may be increased, by dropping a postal card to the office of

THE IRON TRADE REVIEW,

27 Vincent St., Cleveland, O.



THE CANTON GLASS BOARD.

Cuts any Fraction of an Inch by Eights.

Unequaled for accuracy and quick work in cutting square or at any angle. Saves breakages, etc.

— ALSO —

IMPROVED TRAMMEL RULE for Cutting Circles

From 3 inches up to 48 inches, Segments, Gothic Shapes, etc.

SEND FOR CIRCULAR.

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THE GRAVES PASSENGER AND FREIGHT. **ELEVATORS**

THE GRAVES ELEVATOR CO.

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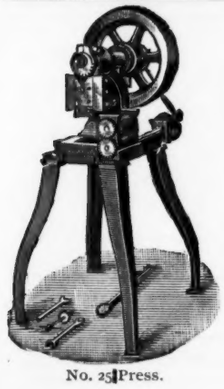
NEW YORK, 92-94 LIBERTY ST. DETROIT, HODGES BUILDING.

BOSTON, 620 ATLANTIC AVE.

2500 IN DAILY USE. CATALOGUE ON APPLICATION.



No. 25 Press.

THE TOLEDO MACHINE TOOL CO.,

MANUFACTURERS OF

Presses, Dies and Special Machinery,

FOR BAR AND SHEET METALS. DIES FOR ALL KINDS OF WORK.

Mention this paper. SEND FOR ILLUSTRATED CIRCULARS.

Oak and Superior Sts., TOLEDO, OHIO.

13-16, No. 22	3 50
¾, Nos, 13 to 15	3 20
¾, Nos. 16 to 18	3 40
¾, Nos. 19 and 20	3 50
¾, No. 21	3 60
¾, No. 22	3 70
11-16, Nos. 13 to 15	3 50
11-16, Nos 16 to 18	3 60
11-16, Nos. 19 and 22	3 70
11-16, No. 21	3 80
11-16, No. 22	3 90
⅝, Nos. 13 to 15	3 70
⅝, Nos. 16 to 18	3 90
⅝, Nos. 19 and 20	4 00
⅝, No. 21	4 10
⅝, No. 22	4 20
⅝, No. 23	4 40

Light Band.

1½ to 6 by ⅛ to 3-16 inch	2 15
1½ to 6 by Nos. 11 and 12	2 25
1 to 1¾ by ⅛ to 3-16 inch	2 35
1 to 1¾ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 inch	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 inch	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 inch	3 25
⅝ and 9-16 by Nos. 11 and 12	3 35
½ by ⅜ to 3-16 inch	3 55
¼ by Nos. 11 and 12	3 65

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	2 95
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 25
No. 15 to 17	2 40
No. 18 to 21	2 55
No. 22 to 24	2 65
No. 25 to 26	2 75
No. 27	2 85
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 25
C No. 1, " "	2 40
C H No. 1, " "	2 50
C H Flange, " "	3 50
Extra Flange "	4 00
Solid Fire Box "	4 75

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 25
Shell	2 50
Flange	2 75
Marine Flange	3 00
Fire Box	4 00
Above includes plates 90 inches wide.	
90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in, inclusive	08
9-16 to ½ in. "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅝ to 11-16 and 4½	10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	11
3-16 in	13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to 5⅛ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 35
Tire	" 2 25
Spring	" 2 80
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and burr	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	15c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ lb 9@10
Wright's	℔ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 45
Munson's Short Lap Double and Light Double Leather	dis 50
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

DO YOU USE OILERS?
THEN USE THE BEST.
THE PERFECTION.

RAU MANUFACTURING COMPANY,

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Copper, Brass and Tin Oilers of all Descriptions, also

TORCHES, LANTERNS, ETC.

235 Lake St., CHICAGO, ILL.

THE ROBERT AITCHISON PERFORATED METAL CO.
CHICAGO, ILL.

ESTABLISHED 1868

PERFORATED METALS OF ALL KINDS

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WORKS AT SOUTH CHICAGO.

AURORA TOOL WORKS,
AURORA, IND.
Successors to **E. A. SCHUMACHER,**
MANUFACTURERS OF
DRILL PRESSES

14" Sliding Head Bench Drill.
20" " " Plain with Patent Quick Return.
22" " " " " " " "
22" " " Back Geared with Patent Quick Return
24" " " Plain " " " "
24" " " Back Geared " " " "
24" " " Back Gear and Power Feed.
28" " " " " " " "
32" " " " " " " "

ENTIRELY NEW DESIGN AND IMPROVED.
40" Gibbed Sliding Head } with Patent Automatic Stop.
24" " " " }

Send for Catalogue and Prices.

AKRON TUBULAR STEEL BARROWS.
STRONG, LIGHT, DURABLE.
Mc NEIL'S BALANCED CHARGING BARROW-A MAN CAN HAUL A TON
PATENT
AKRON TOOL CO.
AKRON, O. MAN'FRS.

Borax.

₰ lb 12

Chalk.

White ₰ gross 50
White Crayon ₰ gross 12@12½ dis 10
Red dis 70
Blue dis 85

Chucks.

Cushman's 4 Jaw Independent dis 45
" Combination dis 40
" Geared Scroll dis 30
" 2 Jaw Brass Workers dis 30
" Drill dis 35
Wescott's Scroll Combination dis 33⅓
" Independent dis 40
" Little Giant Drill dis 30
Horton's Universal dis 40
" Independent dis 45
Whiton's Independent dis 45
National Combination dis 40
Sweetland " dis 40
Almond Drill dis 20
Morse " dis 15
Skinner's Combination Lathe dis 40&10
" Independent Lathe dis 40&10
" Universal Lathe dis 40&10
" Drill dis 35

Cutters and Reamers.

Cleveland dis 10@15
Pratt & Whitney dis 10@15
Standard dis 10@15
Morse dis 15
Brown & Sharpe, Milling Cutters dis 15
" " Gear Cutters dis 15

Crowbars.

Cast Steel ₰ lb 3½
Iron, steel points ₰ lb 3½

Drill and Drill Sockets.

Twist Drills dis 50&10
Morse Taper and Straight Shank to 1½" dis 50&10
Morse Taper and Straight Shank Larger than 1½" dis 25
Drill Sockets dis 25
Standard Twist Drills dis 55@55&5
Cleveland " " dis 55@55&5

Emery.

	No. 4 to No. 54	46 gr.	150 gr.	Flour, C. F. F. F.
Kegs, ₰ lb		4½c	5 c	2½c
½ kegs ₰ lb		4¾c	5¼c	2¾c
¼ kegs ₰ lb		5 c	5½c	3 c
10 lb cans, 10 in case		6 c	6½c	5 c
10 lb cans, less than 10		10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. dis 50@50&5
H. H. Barton dis 50@50&5

Emery Wheels.

Detroit dis 55@60
Norton's dis 55@60
Grant dis 55@60
Sterling dis 60
Celluloid dis 10&33⅓
Northampton dis 55
Crystal dis 65@70
Vitrified dis 60
Vulcanite dis 60&10
Hamden dis 60&10
Cyclone dis 60

Files.

Nicholson dis 60&10@60&10&10
" X. F dis 25
Kearney & Foot dis 60&10@60&10&10
Black Diamond dis 60&10@60&10&10
Arcade dis 60&10@60&10&10
McClellan dis 60&10@60&10&10
Disston's dis 65@70
Western dis 70
Stub's dis 25
Grobet's dis 30
Reynolds Bros.' Hand Cut dis 50
Industry File Works, Hand Cut dis 50

Hammers.

P. S. W dis 40
Atha new list, Jan. 15, 1887 dis 50
Heavy hammers and sledges under 5 lbs 15c
" " " " over 5 lbs 12c

Jack Screws.

Illinois Bolt Co. list dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₰ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 dis 75
Standard Penny Nails, ₰ keg card rate
Car lots $1.70
Less than car lots $1.75

Oilers.

Zinc and Tin dis 60
Brass and Copper dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₰ doz dis 10@10&10

Packing, Steam.

Boston Belting Co. dis 60
American Packing Hemp ₰ lb 9@10
Russia " " ₰ lb 14
Italian " " ₰ lb 13@19
Plumbago Piston ₰ lb 40
Peerless ₰ lb 60
Morrison's " ₰ lb 50
Square Flax " ₰ lb 50
Sheet Rubber ₰ lb 12&24
Excelsior Rubber ₰ lb 48
Rainbow { Full Rolls 50c ₰ lb; Less than Full Rolls 60c ₰ lb

For Sale for Cash, or Credit on Car Trust.

20 Second-Hand Standard Passenger Coaches.
30 New Standard Gauge Passenger Coaches, built at one of the best works in the United States. All modern improvements. Price, $3,700 each. Now ready to letter.
40 Second-Hand Narrow Gauge Locomotives, different sizes.
Second-Hand Standard Gauge Locomotives, different sizes.
Second-Hand Box Cars 20 tons capacity, liberal terms.

These Locomotives have been overhauled all in good condition, ready for immediate delivery.
1,000 tons of 40-lb. second-hand steel and iron rails.
800 tons of 35-lb iron and steel rails, second hand.
1,200 tons of 40-lb. iron and steel rails. All these rails are in good order.
Also 9 Sleeping Cars suitable for theatrical purposes, second-hand. 70 Box Cars and 70 Coal Cars, 20 tons capacity each, second-hand.
Southern and Western Delivery.

Agent for Wm. B. Pollock & Co.'s Oil Tank Cars, for sale at lowest possible prices. Photos and and specifications sent with prices if desired. Bonds negotiated on new and old roads. Long roads preferred.

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AGENTS: J. H. FALL & CO., Nashville, Tenn.
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For information call on or address,

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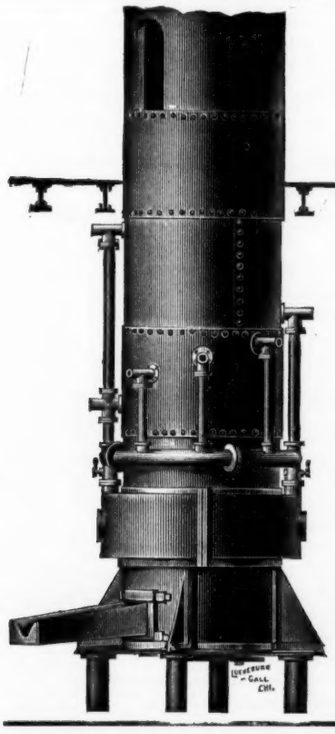

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GREINER
Patent Economical
CUPOLA.

10 to 50 Per Cent. Saving in Fuel,

With Corresponding Increase in Quality of Iron Melted, Over any Existing Cupola.

15 Per Cent Saving Guaranteed.

Can be Applied to any Type of Cupola Now in Use.

400 IN USE IN EUROPE.
U. S. REFERENCES GIVEN.

AGENTS WANTED.

The Greiner Economical Cupola Co.,
714 Bort Building,
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FOR SALE---BLOWING ENGINE.

Vertical pattern, with balanced steam slide valve gear, steam cylinder 14-in. diameter, air cylinder 40-in. diameter, stroke 24-in., 1 to 190 strokes per minute; engine new. For price and articulars address **THE JAMES LEFFEL & CO., Springfield, O.**

Eclipse Gasket ..... ℔ lb 75

Picks.

Railroads, 5 to 6 lbs. ..... $12 dis 60
" 6 to 7 lbs. ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 40
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 50@55

Rivets.

Iron, Thousand, list November 17 ..... dis 40@40&10
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 40@40&10
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ℔ lb 13½
Sisal, ¼ inch and over ..... ℔ lb 12½

Sand Paper.

B. A. & Co. ..... dis 50@50&5
H. H. Barton's ..... dis 40@45
New England Flint ..... dis 50@50&5
Barton's Garnet ..... dis 20

Saws.

Disston's Circular ..... dis 40&10
" Band ..... dis 25
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Diston's ..... dis 30
Atkins' Circular Saws ..... dis 40&45
" Mill, Mulay and Drag Saws ..... dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... 70c per ft
" Dexter Cross-cuts ..... 50c "
" Diamond " ..... 30c "
" Tuttle Tooth Cross-cuts ..... 25c "
" One-man Cross-cuts ..... 32c "
No. 1 Handles ..... 23c per pair
No. 6 " ..... 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "
Detroit Saw Works, Circular ..... dis 50
" " " Band ..... dis 25
" " " Mulay ..... dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron ..... dis 70
Round head iron ..... dis 65
Flat head brass ..... dis 70
Round head brass ..... dis 65
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set ..... dis 70
Set C. H C. P. ..... dis 70
Machine, flat head, iron ..... dis 65&10
Machine, round head, iron ..... dis 60&10
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... per doz 5.25
Hussey & Binns, railroad ..... per doz 8.00

Taps.

Cards, Hand and Nut to 2 in. ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in. ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Twine. BC. B.

No. 12, Flax Twine, ¼ and ½ lb Balls ..... 21C@29C
No. 18, " " ¼ and ½ lb " ..... 18C@28C
No. 36, " " ¼ and ½ lb " ..... 16C@27C
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine) 11½c
3-Ply " 1 lb Balls ..... 12@12¼c
3-Ply " 1½ lb Balls ..... 11@11¼c
Cotton Wrapping, 5 Balls to lb. ..... 15@16c

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Jan. 18, 1884

Brass ..... dis 30
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis65& 5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10& 5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 50

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Automatic Sprinklers—
Neracher Sprinkler Co., Warren, O.

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Anti-Friction Metal—
Magnolia Anti-Friction Metal Co., New York.

Axes—
Standard Axe & Tool Works, Ridgway, Pa.

Automatic Stokers.—
Brightman Stoker Co., Cleveland, O.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

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Babcock & Wilcox Co., New York.
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E. H. Jones & Co., Cleveland.
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Skinner Engine Co., Erie, Pa.
James Leffel & Co., Springfield, O.
Chas. Miller, Beaver Falls, Pa.
Thos. F. Bishop & Co., Cincinnati, O.
Variety Iron Works, Cleveland.
Weston Engine Co., Painted Post, N. Y.
The Golley & Finley Iron Works, Lima, O.
Brightman Stoker Co., Cleveland, O.
W. C. Leffel & Co., Springfield, O.

Blowers—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.

Blowing Engines—
The James Leffel Co., Springfield, O.

Bridges—
American Bridge & Iron Co., Roanoke, Va.

Barrows—
Akron Tool Co., Akron, O.
The Kilbourne & Jacobs Mfg. Co., Columbus, O.

Boiler Feeders—
Van Auken Steam Specialty Co., Chicago, Ill.

Belt Dressing—
White Oak Belting Co., Cleveland.

Belt Elevators—
Lane & Bodley Co., Cincinnati, O.

Brick Machinery—
Straub Machinery Co., Cincinnati, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.

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Jeffrey Mfg. Co., Columbus, O.

Cupolas—
Victor Colliau, Detroit, Mich.
Greiner Economical Cupola Co., Chicago, Ill.
M. Steele Co., Springfield, Ill.

Connecting Rods—
W. E. Leard, New Brighton, Pa.

Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.
Aurora Tool Works, Aurora, Ind.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Godfrey J. Bremer, Kalamazoo, Mich.

Drop Forgings—
Palmer, Cunningham & Co., Philadelphia, Pa.

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Akron, Canton, Steubenville, Marietta and Wheeling	†2:40 P M	†11:10 A M
Akron & Canton	*6:45 P M	*3:15 P M
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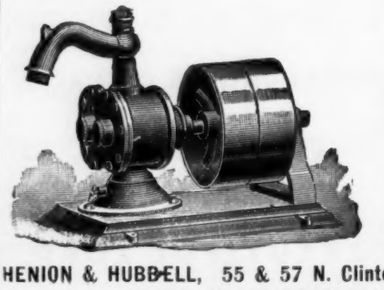

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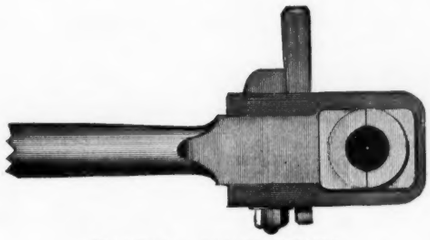

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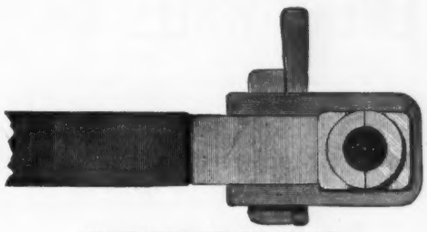

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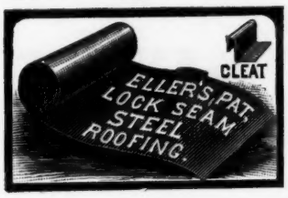

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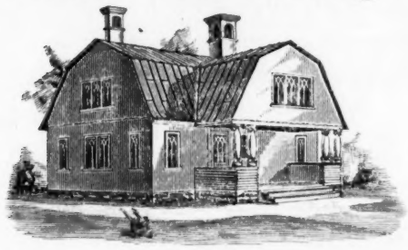

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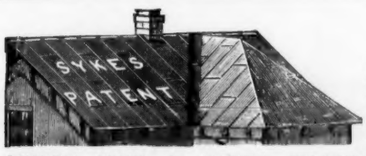

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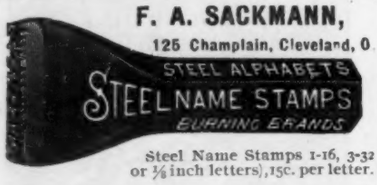

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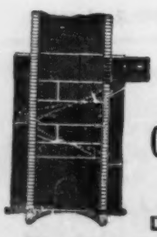

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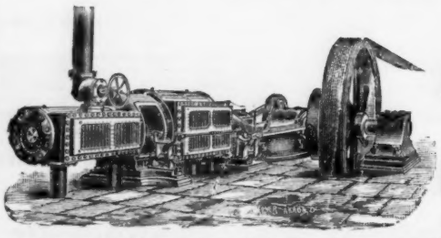

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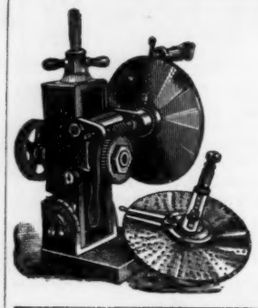

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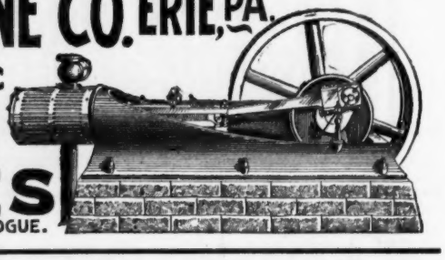

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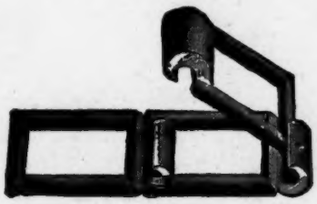

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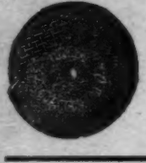

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